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Founder and First Editor
(1911-1939), C. G. GREY

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AN OPERATIONAL REQUIREMENT

WHATEVER the overall conclusions that may come to be drawn about the current state of the art of aviation as indicated at the recent S.B.A.C. Display, it will certainly be generally acknowledged that 1958 was a good year for the helicopter enthusiasts. Indeed, it says much for the drive and energy of this particular section of the industry that five of the new aircraft on show had rotary wings. It is all the more noteworthy that one of the largest and the smallest of these rotary-wing newcomers were built on a private-venture basis—which shows the confidence that Britain's helicopter industry has in its future. Certainly it can claim to be ahead of the World in the application of gas-turbine power to shaft-driven helicopters, and it is far from being behind in the successful exploration of other less direct methods of driving the rotor.

However, quite apart from the open display of these technical developments and the impressive demonstration of the flying capabilities of our new large rotary-wing transports, the Farnborough scene afforded, also, yet another salutary reminder of the difference between the acres of space needed for the operation of fixed-wing aeroplanes and the few square feet required for take-off and landing by the direct-lift craft. In point of fact, when a 28,000-lb. aircraft powered by two gas-turbines can be seen to rise and descend vertically—and to remain absolutely stationary 300 ft. in the air for more than five minutes, the full implications of the well-worn initials VTOL really become apparent.

It was, however, a pity that the Farnborough visitors could not be given a flying demonstration of the other—pure-jet-lifted—VTOL aircraft displayed there, but it was only to be seen in the static aircraft park. As this represents an entirely different method of satisfying the vertical take-off and landing requirement, it would have been most interesting to study, for example, its transition behaviour and its hovering stability in relation to the performances of the other vertical risers on show. These comparisons will have to wait for another occasion.

Meantime it is worthy of note that one of the three papers presented at the recent Madrid Conference devoted specifically to the subject of VTOL aircraft and their powerplants, gave a comprehensive survey of an astonishing variety of current American VTOL and STOL research projects. This immediately brought home the fact that this particular branch of the aeronautical sciences is still at a comparatively early stage of its development. Indeed, as the lecturer explained, so little is really known about the problems involved that the choice of a particular approach to meet the overall requirement cannot as yet be made with any certainty. This, he said, explains why so many different projects are being studied in America; until more is known about the behaviour of these devices it is not possible to determine which will be the best solution to pursue.

We in this country are not so fortunate that we can indulge in such a liberality of full-scale research. Our efforts have already had to be channelled into certain specific directions and there is an urgent need—as a distinguished regular contributor to our pages points out in this issue—for the development of such craft for military transport purposes. There are indications, however, that the practical application of some of the more refined forms of VTOL aircraft is not so far off as many people believe; and this point was, in fact, made by one of the British lecturers at Madrid. Emphasizing the need for prompt attention to be given to solving some of the ancillary operational problems involved in using the VTOL aircraft to the best advantage, he commented: "VTOL is now with us just as soon as we want it." And he went on to conclude that unless effort is put into solving these problems now there is a chance that we may find that we have the aircraft but not the means of making full use of them.

He might have added that one particularly important piece of "ancillary equipment" is a suitable site within the city boundaries from which the VTOL craft of the not-too-distant future can be operated. We have already referred to the considerable private-venture effort that has been put into helicopter development by companies in this country. It has, in fact, also fallen to private enterprise to show the way towards getting on with the job of providing London with a suitable site from which helicopters can operate. The small platform over the Thames now in the active stages of preparation is no more than an experiment. The fact that it has only come about because of the energy and drive of interested people in the industries most concerned and that it represents a welcome and refreshing gesture of confidence in the future, does not alter its experimental status. It cannot in any way constitute the final heliport for London—nor is it intended that it should.

It seems high time that some signs of energetic action in this direction were forthcoming from the planners and Ministries concerned, who seem to have been content, so far, to coast along behind the private venturers. By all accounts the VTOL airliners are not so far away in time that there is all the time in the World to prepare the special facilities needed for their operation. It would be disastrous if, as was suggested in Madrid, when they do arrive we have not the means of using them properly.

B

MATTERS OF MOMENT

That Canberra Replacement

ACCORDING to recent reports, the Canberra-replacement aircraft, about which there has been of late so much unofficial speculative discussion, has the official designation OR.339. It has been said, too, that Short Brothers and Harland, Ltd., as well as the English Electric company are among those submitting designs for this supersonic aeroplane which, it is also suggested, is to be capable of VTOL operation.

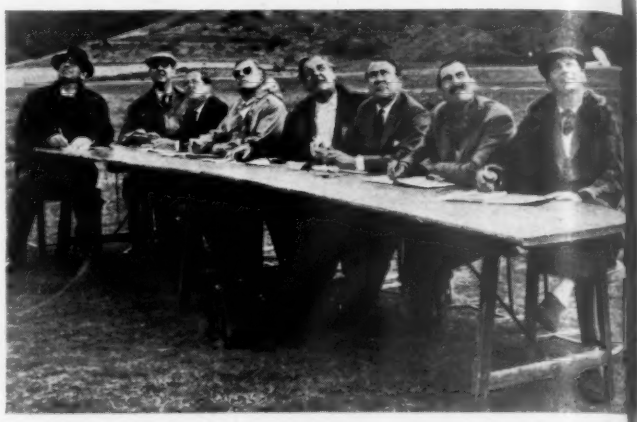
It would in fact seem highly likely that Short's experience with the SC.1 vertical-riser would prove extremely valuable in providing a complete aircraft with VTOL capability or, perhaps, a lifting platform for an otherwise conventional airframe. English Electric, on the other hand, might also be expected to be given the task of following up their successful Canberra with a replacement. But since joint efforts seem to be favoured by the Ministry of Supply, it is possible that some other interested party in the OR.339 project might be brought in to speed development and to share the load. The resources of a company such as the Supermarine section of Vickers-Armstrongs which has a well-knit design team and considerable experience of military aircraft development and production, might be considered in this context.

It might well be, then, that the Canberra replacement turns out to be a truly joint effort with three companies involved. But whatever the solution, the most likely powerplant for the OR.339 airframe is still a pair of Bristol Olympus B.Ol.7R turbojets with Bristol-Solar afterburners or two Rolls-Royce R.B.142 bypass turbojets with afterburners—as suggested in our previous issue.

Steps Towards an NA.39 Order

ON September 16 the Ministry of Defence announced that it had decided "to place orders for long-dated materials and the necessary jigs and tools for the first batch of NA.39 aircraft for the Fleet Air Arm." At a Press conference the next day Mr. Eric Turner, chairman of Blackburn and General Aircraft, Ltd., was questioned about the implications of this statement. He said that neither Blackburns nor the Ministry of Supply, which would order the aircraft, knew anything officially about the Ministry of Defence statement. Mr. Turner, however, was confident that they would receive an official order for this high-speed strike aircraft in due course.

It has been reported that 50 NA.39s for the Royal Navy are to be ordered in addition to the development batch of 20 now being produced. The 1958 Defence White Paper stated that the R.A.F. was also considering the adoption of the NA.39. But since then it has been widely reported that the aircraft does not meet R.A.F. requirements for a Canberra replacement; in particular, that it does not have the supersonic performance at high altitude which the R.A.F. requires.



ATTENTION TO DETAIL.—The judges of the second National Glider Aerobatic Contest at Dunstable, on September 21, were (left to right) Air Cdr. A. H. Wheeler; M. Imray; Capt. H. S. Broad; G. A. V. Tyson; Maj. Oliver Stewart (chairman); C. K. Turner-Hughes; Wg. Cdr. H. P. Powell; and A. W. Bedford. See also page 506.

Mr. Turner was questioned about this. He said that Blackburns had proposed the NA.39 to meet the R.A.F. requirement for a Canberra replacement; they were the only company to offer an aircraft which was in existence. He felt that the high-altitude performance required by the R.A.F. for its Canberra replacement was unrealistic. He believed that the NA.39 was the right aircraft for the R.A.F. and that it would eventually enter service as a land-based as well as a sea-based aircraft. Naval NA.39s should go into service in 1961.

As a high-speed low-level strike aircraft for under-the-radar attacks the aircraft is said to be three years ahead of any comparable aircraft in the Western World. Its development has received dollar aid under the Mutual Weapons Development Programme. An initial batch of 20 NA.39s was ordered in 1955; the first aircraft flew on April 30 this year, the second in August, and the third is expected to fly within the next few weeks. The remaining development aircraft will follow at similar intervals; in due course about half of these are likely to enter operational service with the Royal Navy.

A detailed technical assessment of the NA.39 appeared in THE AEROPLANE on May 9 this year. It is a two-seat strike aircraft designed to operate with nuclear weapons from aircraft carriers and to carry out entire missions at just above wave-top or tree-top level if necessary. In this way radar warning of its approach is cut to the minimum.

AT HOME.—Among the 34 R.A.F. Stations "At Home" to the public on Battle of Britain Saturday, last weekend, R.A.F. Gaydon made a special feature of its V-bomber equipment. Here a Victor is out for inspection by the visitors. See also pages 503-504.

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NEW LIGHTWEIGHT.—Sqn. Ldr. Neville Duke is seen here test-flying the Garland Bianchi Linnet two-seat light aeroplane. It has a 90-h.p. Continental engine.

Photograph copyright "The Aeroplane"

U.S. Defence Budget

ALTOGETHER the 85th United States Congress has appropriated $39,600 million for military functions of the Department of Defence for the 1959 fiscal year, making it the largest American peacetime budget since 1953.

The money appropriated is $816 million more than the Administration requested from Congress in its budget message to Congress, and approximately $5,000 million more than the amount provided for the 1958 fiscal year.

The U.S.A.F. has received $17,900 million, of which approximately $6,600 million is for aircraft and related procurement and $743 million for research and development. Operation and maintenance of Air Force equipment is budgeted at about $4,000 million. The U.S. Navy's appropriation was $11,400 million, an increase of $39 million over the President's request. The amount given for Naval aircraft was more than $2,000 million, and research and development was voted $821 million. The U.S. Army was voted approximately $9,000 million, which includes about $1,700 million for equipment and missiles. In addition, the Advanced Research Projects Agency of the Department of Defence was voted $520 million.

A total of more than $503 million has been given for U.S.A.F. ballistic missile launch and support systems and $465 million for other missile systems. The Atlas ICBM launch and support programme amounts to $190,800,000 and the Titan ICBM programme is $86,500,000. The Thor IRBM programme is $91 million and the Jupiter IRBM $118,400,000. The Bomarc air-defence missile expenditure is by far the largest single item in the U.S.A.F. 1959 missile programme. It totals over $346 million—more than 70% of the programme for non-ballistic missile launch and support equipment.

Engine For The Vanguard

DETAILS of the Rolls-Royce Tyne turboprop were given at the opening meeting of the 1958-59 season at the Weybridge branch of the Royal Aeronautical Society on September 17. By a coincidence, the first flight engine had arrived at Weybridge that day. The lecturer was Mr. D. McLean, B.Sc. (Eng.), A.F.R.Ae.S., assistant chief designer of Rolls-Royce, Ltd.

Detail design of the Tyne (then known as the R.B.109) began in 1953. A two-spool engine, it has stemmed from design work on the Conway by-pass turbojet. At the same time it benefits from the five million hours of experience with the Dart. Up to the date of the lecture the Tyne had been run for 6,500 hr., including some time in the Ambassador test-bed.

First run was made in April, 1955, and the design power of 4,000 e.h.p. was obtained. The Tyne R.Ty.11 is rated at 5,525 e.h.p. and it will be developed to higher powers with changes only in materials and cooling.

The low-pressure spool driving the propeller has a six-stage compressor and three-stage turbine. The nine-stage high-pressure compressor is driven by a single-stage turbine. The combustion system comprises 10 flame tubes within an annular casing. Inlet guide-vanes and the first row of stator blades on the low-pressure compressor are hollow steel with hot air anti-icing. The remaining stator blades and all rotor blades are of light alloy.

The first seven stages of the high-pressure compressor are of titanium alloy, the final two stages being of steel to withstand the highest temperatures. All stator blades are also steel. Following normal Rolls-Royce practice, all rotor blades are pinned to the discs. The turbine inlet nozzles and blades of the high-pressure turbine are air cooled. The epicyclic propeller reduction gear has a ratio of 0.064 : 1.

To avoid the problem of high drag with low power when on the approach, there is a bleed valve on the low-pressure compressor which dumps air surplus to the needs of the high-pressure compressor. This valve is opened only when the propeller is windmilling, or when there is an overspeed condition, to avoid surging of the high-pressure compressor. Disastrous overspeeding of the low-pressure compressor for any reason is guarded against by the fact that when the low-pressure turbine starts to go faster than the low-pressure shaft, a nut is unscrewed and the fuel supply is cut off by operation of a valve via a cable and bell-crank linkage. This system operates in 1/15 sec. (it takes 3 sec. to burst the turbine).

FOR THE NAVY.—Boundary-layer control gives the Blackburn NA.39 low-level strike aircraft a good deck-landing performance. Its fuselage is Area-ruled for low drag and good controllability at high speeds. The aircraft is powered by two 7,000-lb. thrust de Havilland Gyron Junior D.G.J.1. engines.

Photograph copyright "The Aeroplane"

A Percival Revival

IN our issue of August 15 we referred to the pending winding-up of Edgar Percival Aircraft, Ltd., manufacturers of the EP.9 agricultural aircraft at Stapleford Tawney, Essex. It is now understood that a stay of execution has been granted by the Vacation Court judge, and Capt. Edgar Percival, chairman and managing director, has said that the company is now completely out of liquidation.

We earlier mentioned the possibility of the company being acquired by Samlesbury Engineering, Ltd., of Samlesbury, near Blackburn, and we understand that the Percival company is continuing in business as a result of a deal with Samlesbury Engineering. The interest of the Finance Corporation for Industry, to whom £344,326 of unsecured liabilities were due, will be bought out.

A Founder of A.S.T.

WITH regret we record that Wg. Cdr. Harold Francis Jenkins, O.B.E., A.F.C., died on September 13 after a long illness.

Having served a lifetime in aviation, he is perhaps best remembered for the part he played in the founding of Air Service Training, Ltd., of Hamble, and for his 18 years as chief instructor and general manager of the training division.

Born in 1897, H. F. Jenkins was educated at Victoria College, Birmingham, and during the First World War served in the R.F.C. and R.A.F. From 1926 to 1930 he was an instructor at the Central Flying School, after which he transferred to the R.A.F.O.

Air Service Training—an offshoot of the Armstrong Siddeley Development Co., Ltd., and still a member of the Hawker Siddeley Group—was formed early in 1931, and the first course began on April 14 of that year. In THE AEROPLANE at the time the school was described as the first really serious attempt to set up "an international training establishment in all branches of aeronautics," and none today would question the success of the venture. The commandant was Gp. Capt. R. J. F. Barton, and he and Jenkins had between them practically unrivalled experience of R.A.F. training methods. The idea was that A.S.T. should provide instruction comparable to Service standards, and apart from an initial equipment of Avro Avians and Tutors, some Armstrong Whitworth Siskins and Atlases—purely Service types—were acquired. The high standard of training has been maintained over the years by a close association of contemporary training methods and the re-equipment with appropriate aircraft types.

When the Second World War began, Wg. Cdr. Jenkins rejoined the R.A.F., but was seconded to A.S.T. to form and command Beam Approach Schools and Schools of Air Traffic and Airfield Control at Watchfield, where he remained until 1947.

He retired from A.S.T. in 1949, and from 1950 to 1951 was Master of the Guild of Air Pilots.

A Last Reprieve for Croydon?

SOME vigorously worded letters in our own postbox—and others, couched in similar terms, published in last week's newspapers—provide desperate final reminders that Croydon Airport is about to be an airport no longer. After several reprieves a "final" date for its closing has been set, by the Ministry of Transport and Civil Aviation, at December 31.

Since this latest reprieve letters have been sent by the Ministry to the Croydon operators and others suggesting that, the Kent County Council permitting, they can move to R.A.F. Biggin Hill, where they will be tenants of the Air Ministry. There are, however, limitations in the prospects at Biggin. Because no Customs facilities will be available no fare-paying passengers may normally be taken in and out, though aircraft may be based and maintained there and (provided they are radio-equipped) may be flown to Gatwick to pick up and put down passengers. There, for the moment, the matter rests; the majority of operators and others at Croydon had already refused to move to Gatwick which, with its one runway, is quite unsuitable for small or medium aircraft operation even if, radio-equipped, they could be fitted into the traffic pattern. Office and hangar accommodation would need to be built and the costs would be three or four times those of Croydon. In its turn the proposed area for use at Biggin Hill is badly dilapidated, and secure tenure of only four years has, we understand been offered.

All is not, perhaps, yet lost. As there have been reprieves before, so there may be other reprieves in the future. There is a lot to be said—in spite of the Ministry's insistence that Croydon cannot conveniently remain in use within the present traffic control pattern—for delaying, as long as possible, the moment when the ground really begins to be broken up for the construction of council houses and factories.

As a correspondent in *The Financial Times* put it on September 18, the pattern of air travel is changing with the prospect of VTOL and STOL aircraft and an open space which is reasonably near, but not too near, the centre of London may be badly needed in the 1960s. "Let him [the Minister] at least have the good sense to maintain the airfield as an open space for a trial period of, say, three years so that misthinking can be rectified, which will not be possible if the land is chopped up into housing plots. . . ."

Meanwhile letters to THE AEROPLANE make strong pleas, even at this eleventh hour, for the retention of Croydon as an aerodrome. Vendair write to say that "we should pause for a moment to fully comprehend what is being done by a Ministry, one of whose functions, under the Air Navigation Acts, is to provide facilities for flying."

The letter adds that, if Croydon is closed, we shall lose:—

"1. An airfield with a landing or take-off run of 1,600 yards which, due to its type of soil, has the advantages of all-weather operation enjoyed by airfields with runways costing hundreds of thousands of pounds, plus their associated heavy maintenance costs.

"2. Substantial two-storey airport buildings with Customs hall, refreshment facilities and a residential hotel.

"3. Hangarage at present occupied by 80 aircraft (estimated accommodation for a total of 150 available), plus stores buildings, fire station and petrol storage.

"4. [An airfield with] a weather record which, so far as cloud-base is concerned, is the best in the London area.

"5. Customs facilities on the S.E. corner of London for [operators of] light, non-radio and charter aircraft who can clear in or out of the London control zone for the Continent with the least inconvenience to themselves or the control authorities under IMC weather conditions.

"6. A home for three flying clubs, four flying groups, two charter companies, numerous executive and private aircraft, plus several overhaul and manufacturing organizations. In fact, with its present constitution, there are few flying requirements which cannot be met by one or other of the airport organizations.

"The arguments against the retention of Croydon as a secondary airport, i.e., control difficulties, noise, insufficient traffic, have all been demolished but the Ministry's decision remains.

"In the six months of operation ended June 30, 1958, the total aircraft movements were 32,676 (June being 7,310). Further, in July and August (when Gatwick was also in operation) the movements were 7,050 and 8,464 respectively—not bad for a redundant airport."

David Brown Industries have written to say that "our company, and many others operating private aircraft specifically for the purpose of furthering home and export business, must have the use of an airfield near London in order to operate with speed and efficiency.

"With the closure of Hendon and Northolt, Croydon is the only airfield available to us which is within easy reach of London.

"Apart from this, Croydon Aerodrome is regularly used by commercial operators, by ambulance services, by the Press, by flying clubs, and, ironically enough, by the R.A.F. and U.S.A.F. as an alternative landing ground when poor weather conditions prevail at Gatwick.

"So far no suitable alternative is proposed. Surely the Minister of Transport and Civil Aviation should think again before prejudicing the efficiency of industries already handicapped by bureaucracy, and hamstrung by taxation."

The Ministry's policy was, it has to be admitted, made very clear more than five years ago in a White Paper (Cmd. 8902) entitled "London's Airports." In this it was categorically stated that, when the new Gatwick came into use, the number of airports in the London area would need to be reduced in order to simplify the traffic pattern. Of the seven Ministry-operated airports then in use, four would have to go—including Croydon, which is inextensible and inside the present London Control Zone.

News of Aircraft, Engines and Missiles

CONWAY-VULCAN CRASH.—Destruction of the Conway-Vulcan test-bed at a Battle of Britain display on September 20 at Syerston, Notts, will set back the engine development programme by several months until another test-bed is available. According to eye witnesses the Vulcan, VX770, was flying at about 250 ft. when the starboard wing crumpled and disintegrated. It was the first prototype and had previously been fitted with Avon, Sapphire and Olympus engines. Killed in the crash were K. R. Sturt, Rolls-Royce, pilot; R. W. Ford, Fairey Aviation, co-pilot; W. E. Hopkins, Rolls-Royce, flight observer, and Flt. Lt. R. M. Parrott, navigator. Three R.A.F. ground staff were also killed.

TESTING TIME.—First test fuselage of the Armstrong Whitworth A.W.650 Argosy was put in the water-test tank on September 20. It is a structurally complete specimen with all control circuits. More than 3,000 strain gauges are attached.

SKYLARK FIRING.—The fourth Skylark rocket was fired at Woomera on September 19 and reached a height of 90 miles. Skylarks are being launched for high-altitude research as part of the British contribution to the IGY programme.

OVER TO MISSILES.—The first Douglas Thor IRBM for the R.A.F. was handed over to No. 77 Strategic Missile Squadron, Bomber Command, at R.A.F. Feltwell on September 19. It had been brought by road from the U.S.A.F. base at Lakenheath after crossing the Atlantic in a C-133 Cargomaster.

ALLISON OVERHAUL.—Lockheed Electras will go into service on December 1 (Eastern Air Lines) with a 1,000-hr. overhaul life for their Allison 501 turboprops. The U.S.A.F. at present permits a 1,200-hr. overhaul period for their T56-9 military version of the Allison engine.

REGULUS 2.—First launching of a Regulus 2 missile from a submarine was made on September 16. The missile was launched off the California coast and flew a 200-mile course inland to Edwards A.F.B. The Regulus 2 is an air-breathing missile with a speed of Mach 2 and a range of more than 1,000 miles.

DART CHECK.—B.E.A. have initiated a programme of precautionary examination and modification of the Dart 520s (R.Da.7) in their Viscount 806 fleets. This follows investigation of the failure of a Dart R.Da.7 in the Dart Herald, which is thought to have been caused by loss of lubrication to a bearing and subsequent disintegration of the turbine disc. The modification concerns the oil pressure gauge system, and is intended to give warning of a drop in pressure at the bearing in question.

PARIS NEWS.—Thirteen production Morane-Saulnier 760 Paris four-seat training and liaison aircraft (two Turbomeca Marboré II engines) have now been completed or shipped in parts for assembly abroad. The eighth aircraft completed is to be delivered to the College of Aeronautics very soon. Of the remaining 12, six have gone to Argentina as part of an order for 48, two have gone to America, and one each to the French Air Force, the French Navy, the Shah of Iran, and Venezuela.

BIG BOOSTER.—A 1,500,000-lb. thrust liquid-propellent booster rocket is to be produced by the U.S. Army Ballistic Missile Agency at Redstone. According to *Aviation Daily*, it will be used to put "very large" payloads into orbit and will consist of a cluster of engines already developed. Propulsion elements will be made by the North American Rocketdyne division.

LONG TOM.—Seven high-altitude Long Tom rockets have been fired at Woomera since last year. Developed by Australia, Long Tom is a two-stage high-altitude rocket which can carry a 10-lb. payload to a height of 120 miles. Further Long Tom firings will be made at Woomera to test the range equipment necessary for the Black Knight and Blue Streak missiles.

Howard Levy photograph

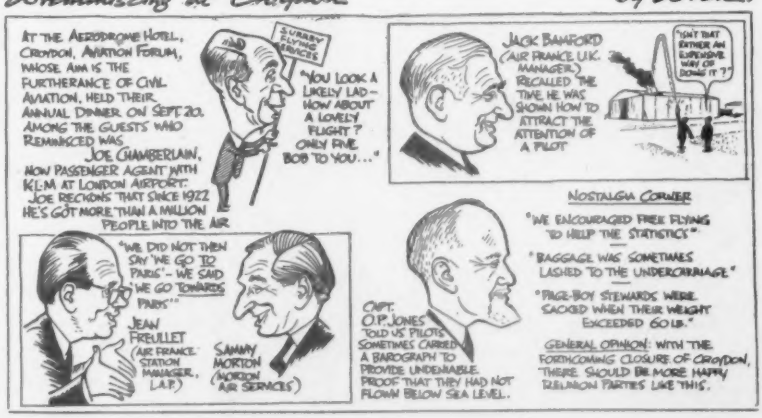
TWO OFF.—Seen at Downsview are the first two DHC-4 Caribou aircraft. The first prototype, CF-KTK-X, is on the left; the second is registered CF-LAN-X.

FIRST FROM CHESTER.—G-APDE, the first Comet 4 to be rolled out of the de Havilland Chester factory, was airborne on Saturday, September 20, and was flown to Hatfield for the completion of its production test programme. On the following day it spent 4 hr. 45 min. in the air. Chester is responsible for producing 14 of B.O.A.C.'s 19 Comets.

ATLAS PROGRESS.—Thirteen Atlas ICBMs have been launched since testing began 14 months ago. Recent tests have been over a 3,000-mile range but flights of up to 6,200 miles are now planned. The first Atlas attempt at this range failed on September 18 when the missile blew up 80 sec. after the launching.

BAADE BB-152.—According to an American report, six prototypes and three production models of the Baade BB-152 four-jet transport are to be built. The first prototype is in the flight-test stage and the second, for structural testing, is now complete. The other prototypes, including one for engine tests, another for structural test to destruction and one with a fully furnished interior, are to be completed by the end of next year. Three production models will be delivered to East Germany's D.L.H. by July, 1960.

Reminiscing at Croydon — *by Wren.*


AT THE AERODROME HOTEL, CROYDON, AVIATION FORUM, WHOSE AIM IS THE FURTHERANCE OF CIVIL AVIATION, HELD THEIR ANNUAL DINNER ON SEPT. 20. AMONG THE GUESTS WHO REMINISCED WAS JOE CHAMBERLAIN, NOW PASSENGER AGENT WITH KLM AT LONDON AIRPORT. JOE RECKONS THAT SINCE 1922 HE'S GOT MORE THAN A MILLION PEOPLE INTO THE AIR
SURREY FLYING SERVICES
"YOU LOOK A LIKELY LAD — HOW ABOUT A LOVELY FLIGHT? ONLY FIVE BOB TO YOU..."
JACK BAMFORD (AIR FRANCE U.K. MANAGER) RECALLED THE TIME HE WAS SHOWN HOW TO ATTRACT THE ATTENTION OF A PILOT
"ISN'T THAT RATHER AN EXPENSIVE WAY OF DOING IT?"
"WE DID NOT THEN SAY 'WE GO TO PARIS' — WE SAID 'WE GO TOWARDS PARIS'"
JEAN FREULLET (AIR FRANCE STATION MANAGER, L.A.P.)
SAMMY MORTON (MORTON AIR SERVICES)
CAPT. O.P. JONES TOLD US PILOTS SOMETIMES CARRIED A BAROGRAPH TO PROVIDE UNDENIABLE PROOF THAT THEY HAD NOT FLOWN BELOW SEA LEVEL.
NOSTALGIA CORNER
"WE ENCOURAGED FREE FLYING TO HELP THE STATISTICS"
"BAGGAGE WAS SOMETIMES LASHED TO THE UNDERCARRIAGE"
"PAGE-BOY STEWARDS WERE SACKED WHEN THEIR WEIGHT EXCEEDED 60 LB."
GENERAL OPINION: WITH THE FORTHCOMING CLOSURE OF CROYDON, THERE SHOULD BE MORE HAPPY REUNION PARTIES LIKE THIS.

LOCKHEED ROLL-OUT.—The first Lockheed C-130B, Hercules military transport, has been rolled out at Marietta, Georgia, and may have flown by now. It has four Allison T56-A-7 turboprops driving 13 ft. 6 in. Hamilton-Standard four-blade 54H60 Hydromatic propellers. The C-130A has Allison T56-A-1 engines and 15 ft. propellers. First deliveries of the new version are scheduled for December next.

MILITARY DEUX PONTS.—The Breguet 765 Sahara made its first flight on September 6. Powered by four Pratt & Whitney CB.16 engines, each of 2,400 h.p., the Sahara has a range of 2,485 miles and a maximum all-up weight of 119,050 lb. Fifteen are on order for the French Air Force.

OVER TO METAL.—Vertol Aircraft has received a $1,130,795 contract for new all-metal rotor blades, and associated components, to replace the wooden blades on U.S.A.F. H-21B helicopters. The new blade, already in use on civil Model 44 helicopters, is an individually changeable component with a C.A.A.-approved service life of 6,000 hr. It has a steel D-nosed spar to which aluminium boxes are bonded.

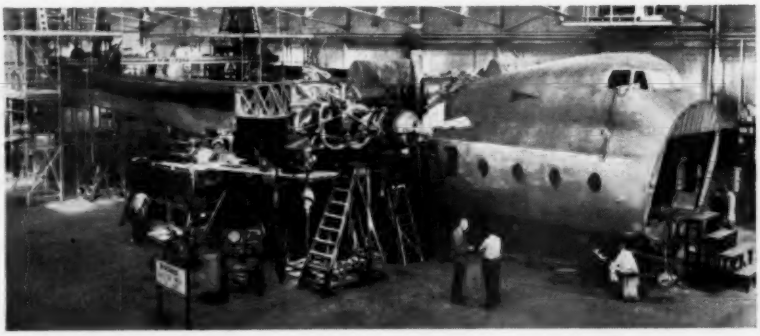
RECORD CONFIRMED.—The F.A.I. has now officially confirmed the helicopter record for distance in a straight line (Class E.1d.) set up by F. Belouchkine (U.S.S.R.) on March 19, 1958, when he covered 794.918 km. between Tushino and Baranovitchi in an Mi-1 helicopter (575-h.p. AI-26B engine).

NUCLEAR PROPULSION.—In U.S. work on nuclear propulsion systems for missiles and aircraft, attention has been focused on systems using enriched uranium and graphite moderators. Results show that chain reactions can be maintained within a 4-ft. cube containing about 60 to 80 kg. of Uranium 235.

BOMARC PROGRESS. — A "substantial number" of Boeing Bomarc long-range surface-to-air missiles for the U.S.A.F. are to be fired between December and the spring of 1959. This test and training programme will be conducted by the 4751st Air Defense Missile Sqn. and will include the firing of salvoes of Bomarcs. It will take place at Santa Rosa Is., Fla.

HELICOPTER DELIVERY.—Col. B. Deleque-Fourcaud is welcomed by Maj. J. Robertson, staff-officer, Land-Air Warfare, of the War Office, after the former had flown one of the two S.E. Alouette 2 helicopters which are to be evaluated by the Army, into Eastleigh Airport, Southampton.

Commercial Aviation Affairs



ARGOSY ASSEMBLY.—Due to fly before the end of the year, the first Armstrong Whitworth A.W. 650 Argosy now has the fuselage assembled with the wing centre-section, tail booms, fins and the inboard Rolls-Royce Dart turboprop engines installed.

VISCOUNT FOR SALE.—Two years after its completion, the Viscount 763 built for the Hughes Tool Co., has been offered for sale by Vickers. The aircraft was ordered for Mr. Howard Hughes, who refused to allow it to be test flown until he was present. Since November, 1956, it has stood under dust sheets at Weybridge, and has never been flown.

C.A.A. CUT-BACK.—Central African Airways will withdraw, on November 1, their network of feeder services operated by Beavers in S. Rhodesia on grounds of economy. The airline states that a private carrier will undertake to operate certain services with the smaller Cessna 180s and Cessna 195s, which should make possible more economic service.

QANTAS PROFIT.—A profit of £344,039 has been returned by Qantas for the year 1957—the 34th consecutive profit in this operator's 37-year history.

S.A.S. AND CHINA.—Last month an agreement came into effect between the Scandinavian Airlines System and the Civil Aviation Administration of China, which operates all that country's domestic and international air services. The agreement involves the honouring of respective traffic documents and the settling of accounts directly in sterling and not, as before, through Aeroflot. S.A.S. was the first airline to sign an agreement (in 1956) with Aeroflot.

SAFARI BANDWAGON. — East African Airways have applied for permission to operate a Colonial Coach-class service, with ex-B.O.A.C. DC-4M Argonauts, between Nairobi and London. A request has been made for a frequency of once weekly, increasing to two a week, with services starting on November 1.

FINANCING RE-EQUIPMENT.—The Australian Federal Cabinet agreed on September 10 to finance the re-equipment of T.A.A. and Ansett-A.N.A. at an estimated cost of £A14 million. The finance covers the cost of two Electras and four Viscount 800s for Ansett-A.N.A., and two Electras and two Viscount 800s for T.A.A. The total statutory financial backing is now £A9 million for Ansett-A.N.A. and £A5 million for T.A.A.

B.E.A. FREIGHT INCREASE.—In the first four months of the present financial year (April-July), B.E.A. recorded a 13% increase in freight ton-miles compared with the previous year. At the present rate revenue from freight traffic totals about £1.9 million per year.

KHARTOUM RE-OPENED.—Khartoum Civil Airport was re-opened to traffic on September 5 after strengthening and re-surfacing of the runways had been completed.

T.W.A. RECORD.—During August, T.W.A. set new records, domestically and internationally, in terms of revenue passenger miles and revenue. Domestic passenger miles increased by 2% and on international routes by 14% compared with the previous year. Revenue was 9% better. On the North Atlantic route to London, T.W.A. carried 39% more passengers than in August, 1957.

News About People

WESTLAND POST.—Capt. W. B. Axford, O.B.E., R.N. (Retd.), has been appointed chief development engineer of Westland Aircraft, Ltd. He will be in charge of flight and operation engineering requirements.

ELLIOTT DIRECTOR. — Cdr. H. Pasley-Tyler, R.N. (Retd.), has been appointed a director of Elliott Brothers (London), Ltd. He is at present joint general manager of the company.

EXPORT DRIVE. — Mr. A. P. H. Pehrson, executive director in charge of export sales for Simmonds Aerocessories, Ltd., and Firth Cleveland Instruments, Ltd., is making a sales visit to Italy and France.

PUBLICITY POST. — Mr. Leonard Kingsman, formerly publicity manager of the Bristol Aeroplane Co., Ltd., and later of Central News, Ltd., is to join the board of Norman Davis, Ltd., advertising practitioners of Princes House, Piccadilly, London, W.1, on October 1. He will be responsible for developing a new section of the agency and continue to specialize in aeronautical and automotive fields.

F. R. MANAGER.—Wg. Cdr. H. C. Johnson is now commercial manager of Flight Refuelling, Ltd., in succession to Mr. Michael Cobham, who will remain a director of the company.

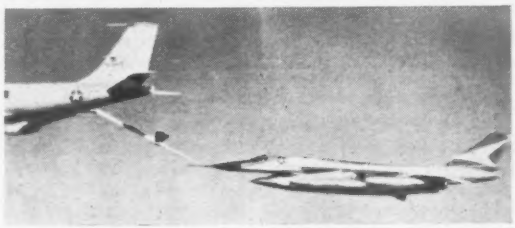
DECCA DEVELOPMENTS. — Mr. K. W. King, A.M.Brit.I.R.E., has resigned from the board of Cossor Radio and Television, Ltd., to join the Decca Navigator Co., Ltd. He will be concerned with the development of navigational systems, particularly overseas, in which field he has had considerable experience.

MADRID MEETING.—Among the 600 people at the I.C.A.S. Congress in Madrid (see page 496), were, left to right, Dr. Claude Dornier, Lt.-Gen. Jose Rodriguez Y Diez de Lecea, Dr. Theodore von Kármán, Mr. Mikhail Kremmef and Gen. Antonio Nunez Rodriguez.

UNITED POST.—Mr. Leete P. Doty has been appointed assistant general manager of the United Aircraft Corpn.'s Sikorsky Aircraft Division as from September 16. He was formerly with the Pratt & Whitney Aircraft Division.

WINSTON SALES. — Expansion in sales by Winston Electronics, Ltd., of Shepperton, Middx., has resulted in the appointment of four specialist regional technical sales engineers: Mr. K. P. Reynolds, in Manchester, covers Yorkshire, Lancashire, Cheshire and the North; Mr. P. Reeves (Birmingham), Derbyshire, Nottinghamshire, Lincolnshire, Staffordshire, Shropshire, Worcestershire, Northamptonshire, Leicestershire and Rutland; Mr. V. Diederichs, London south of the Thames, Gloucestershire, Oxfordshire, Wiltshire, Berkshire, Hampshire, Dorset, Sussex, Kent and Surrey; and Mr. D. A. Jamison, London north of the Thames, Cambridgeshire, Hertfordshire, Buckinghamshire and Middlesex.

Military Aviation Affairs



THIRSTY HUSTLER.—This picture shows the first in-flight refuelling of a Convair B-58 Hustler. A Boeing KC-135 is the tanker aircraft.

ATLANTIC FLIGHT.—A Bomber Command Vulcan flew from Goose Bay, Labrador, to R.A.F. Waddington in 4 hr. 11 min. on September 18. Piloted by Wg. Cdr. F. L. Dodd, with the A.O.C.-in-C., Air Chief Marshal Sir Harry Broadhurst as co-pilot, its coast-to-coast time was 3 hr. 27 min., an average speed of 648 m.p.h.

CANADIAN VISIT.—Lt.-Gen. A. G. Ljungdahl, Chief of Staff of the Royal Swedish Air Force, made a two-week tour of R.C.A.F. installations in Canada earlier this month. Accompanied by Brig.-Gen. S. Noren, and the Swedish Air Attaché in Washington, he arrived at Uplands Airport, Ottawa, on September 2, and was to visit R.C.A.F. stations St. Hubert, Winnipeg, Portage-la-Prairie and Churchill.

DEFENCE MEETING.—The Australian Prime Minister, Mr. Menzies, is to open a meeting of the Commonwealth Advisory Committee on Defence Science in Canberra next month. Sessions will also be held in Melbourne and Adelaide and at the Woomera rocket range. The U.K. delegation, numbering 18, is to be led by Sir Frederick Brundrett, the scientific adviser to the Ministry of Defence.

LACKING LAUNCHERS. — According to a U.S. House of Representatives military-operations sub-committee, the U.S.A.F. and U.S.N. are seriously short of launchers for firing R.P.s from aircraft. At Farnborough four types of British R.P. launchers by Microcell were shown.

ETENDARD NEWS.—A commission of Canadian, Australian and Dutch technicians recently inspected the Dassault Etendard IV M-01 naval fighter. Tests have been made by two pilots of the Brétigny Test Centre to check its characteristics at deck-landing speeds.

R.A.A.F. VALUATION.—The Chief of the Australian Air Staff, Air Marshal Sir Frederick Scherger, left Melbourne earlier this month to make on-the-spot appraisals of the latest missile and military aircraft developments in the United Kingdom and the United States. While abroad, Air Marshal Sir Frederick Scherger will also have talks with British and American Service chiefs and defence officials.

"CENTAUR" RECOMMISSIONED.—The aircraft carrier H.M.S. "Centaur," which has spent the past two years undergoing a modernization programme, was recommissioned at Devonport on September 3.

ALBATROSS OVERHAUL. — The U.S.A.F. has awarded a contract to Lockheed Aircraft Service, Inc., for the maintenance and modification of 71 Grumman SA-16 Albatross amphibians. These aircraft are operated by the M.A.T.S. global search and rescue service.

BRAZILIAN BELL.—A Bell 47J helicopter has been delivered to the Brazilian Air Force for the official use of President Kubitschek. Three others are on order for rescue and transport work at Brasilia.

R.A.A.F. WILLIAMTOWN.—A typical morning scene at R.A.A.F. Williamtown, the base of No. 78 Fighter Wing, with the overnight line-up of Avon Sabres gradually dispersing as pilots taxi out for training exercises. The move of Nos. 3 and 7 Squadrons to Butterworth, Malaya, was described in last week's issue (page 469).

Air Transport

Comet to the Americas

DUE prominence has been given to the Comet 4's fast out-and-home North Atlantic flights, including a non-stop return from New York, and to the three-sector daylight return journey on September 14 from Hong Kong. The time has come now to accept flights of this kind as being quite normal. The Comet 4 was designed to make them regularly in airline service and it is naturally doing so, without hitch, in pre-service test and demonstration journeys.

G-APDA, the first production Comet 4, left Hatfield again at 20.21 hrs. B.S.T. (19.21 hrs. G.M.T.) on September 16 for a sales tour of North and South America and in continuation of the final certification route-proving programme. It reached Gander after 5 hr. 47 min. and, 90 minutes later, left for Ottawa, where it landed at 05.58 hrs. G.M.T. After flying to Toronto, D.H. Canada's base, and Montreal, the Comet left Dorval on September 18 for Vancouver.

As we went to press with this issue the Comet had reached Lima, Peru, after flying to Mexico City from Vancouver. The tour, which is expected to take about 11 days in all, was due to continue this week with flights to Buenos Aires (the base of the latest Comet purchasers, Aerolineas Argentinas), Rio de Janeiro (Brazil), Carácas (Venezuela) or Port of Spain (Trinidad), and New York.

The Comet had flown from Vancouver to Mexico City on September 19 and made demonstration flights during the following day from this airport. On September 21 it left Mexico City for Lima, flying the 2,680 st. miles in 5 hr. 33 min.—an average speed of 486 m.p.h. The fact that the Comet is reported to have arrived at Lima with fuel for a further 2¾ hours' flying suggests that there was not much, if anything, in the way of take-off weight limitation on the flight out of Mexico City's airport, which is 7,347 ft. above sea level.

The Nigerian Airline

ON September 30, The West African Airways Corporation ceases to exist. It is succeeded on October 1 by W.A.A.C. (Nigeria), Ltd., which will take over West Africa's domestic services in Nigeria and the London-Lagos route.

The change, announced some time ago, has come about principally as a result of Ghana's independence and the formation of Ghana Airways. The shares in W.A.A.C. (Nigeria) are divided between the Nigerian Government, with 51%, the Elder Dempster shipping line with 32½% and B.O.A.C. with 16½%. The board comprises Mr. R. W. Baker-Beall, C.B.E., as chairman; Sir George Cribbett, K.B.E., C.M.G., for B.O.A.C., Mr. O. E. T. Evans, O.B.E. and Mr. K. H. Joyce for Elder Dempster and Mr. S. L. Edu, Mr. A. O. Ene and Mallam Sule Katagum for the Nigerian Government.

Internal services in Nigeria, and linking Nigeria and Ghana, will continue much as before, using the former W[illegible] fleet. Yesterday, W.A.A.C. (Nigeria) and B.O.A.C. were to sign a 15-year charter agreement under which B.O.A.C. will provide Stratocruisers and crews for the London-Lagos route. The first Stratocruiser on this service will leave London on October 1, bearing the "flying elephant" symbol, the inscription "Nigerian Airways (W.A.A.C.)" and a Nigerian stewardess will be among the cabin staff.

Initially, services will be at the rate of two a week in each direction, to be increased subsequently. The agreement calls for the frequency of Nigerian Airways services to be at parity with B.O.A.C. within one year of Britannias replacing Stratocruisers on the London-Lagos route—that is, by the summer of 1960.

More Trouble for the Turbojets

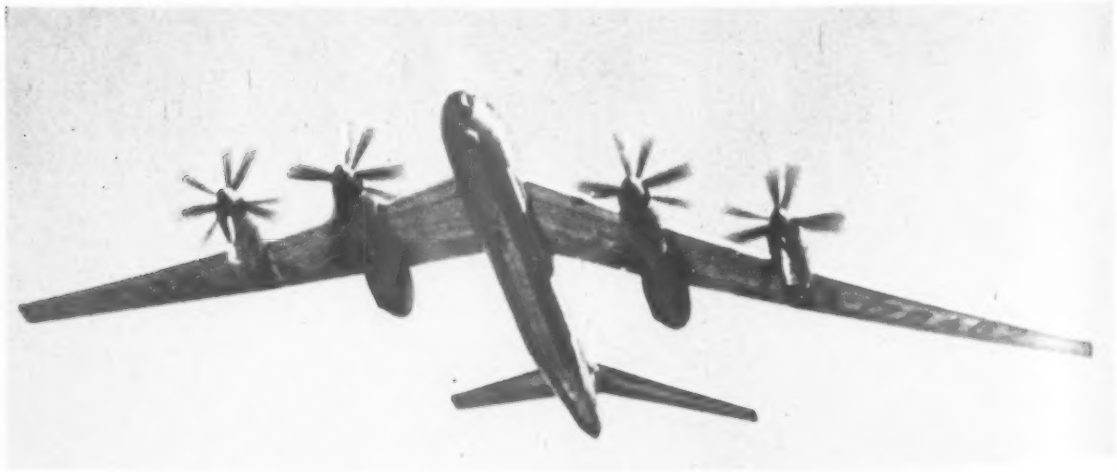
LAST week the Italian Under-Secretary for Civil Aviation stated that scheduled turbojet operations would not, at present, be permitted at Italian civil airports. The reasons given did not include any mention of the noise problem, but were to the effect that the present airports and air traffic control organizations were not ready to accept turbojet aircraft.

Ciampino Airport, Rome, was, the Under-Secretary is reported to have said, "already overcrowded and regular flights by such an aircraft as the Boeing 707 would be an undue strain on safety regulations." He added that the introduction of turbojet aircraft "would present a problem which it might be possible to solve on a technical level, but which might lower the safety level." Pan American had only just announced their plans for the start of 707 services to Paris and Rome on October 27.

The ban, it is understood, will remain in force until the new airport for Rome, at Fiumicino, is ready and until extensions have been completed at Malpensa, Milan's airport. Fiumicino may be ready for limited operations by the summer of 1959, but is not due to receive all Rome's air traffic until the spring of 1960.

Although pressure may be applied successfully for a lifting of this restriction, it seems to us that the Italian authorities are the first to take a realistic stand and are not too proud to admit the limitations of present airport and A.T.C. organizations. There must be other authorities in the World who feel that neither their airport buildings nor their control arrangements are yet ready for the impact of the turbojets. Curiously, Rome's Ciampino Airport and the Italian A.T.C. are among the comparatively few airports and systems which have had practical experience of civil turbojet operations—in the 1952-54 era of the Comet 1.

TUPOLEV'S LATEST.—Circling Ruzyne Airport, Prague, on September 15, a Tu-114D gave an impression of the great size of this four-turboprop transport. Unlike the original Tu-114, the "D" version has a fuselage not much different dimensionally from the "Bear" bomber on which the whole design is based.



'I've nothing against differential toe brakes . . .

I'm just more interested in financial merits!'

To switch from the technical merits of the Viscount 810/840 to its financial advantages is to exchange one success story for another.

Both in first cost and operational economy this latest Viscount is the outstanding aircraft of its class in service. It offers medium haul operators a unique combination of speed, background experience and passenger appeal.

Yet initial cost is 50% less than any other 4-engined turbo-prop, while capacity is greater and seat mile costs are even lower than earlier Viscounts. Present cruising speed is 365 m.p.h. and in 1960 when re-engined with a more powerful version of the Rolls-Royce Dart, the aircraft will become the V840 with speed raised to 400 m.p.h.

The success of Viscounts is based on two important facts. Passengers prefer them—and they produce healthy airline balance sheets.

VICKERS VISCOUNT 810/840

FOUR ROLLS-ROYCE DART PROPELLER-TURBINE ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT575

Arnhem Land Aboriginal bark drawing.

Men of Skill and Experience

WALLY TOMS

Shell Fuelling Operator
at Kingsford-Smith Airport,
Sydney, Australia

ONE OF THE MEN RESPONSIBLE FOR SHELL WORLD-WIDE AVIATION SERVICE

SHELL

P.A.A.-National Link Proposed

AN enterprising deal between Pan American World Airways and National Airlines, under which each will lease the other's jet transports during their respective slack seasons, has been announced in Washington. The deal is dependent upon C.A.B. approval, which has been requested.

The principal provisions of the agreement are as follows:—

1. Pan American will lease jet transports to National during the winter seasons 1958/59 and 1959/60.

2. Commencing in 1960, for ten years, Pan American will lease jet transports to National each winter, and National will lease jets to Pan American each summer.

3. The two airlines will exchange 400,000 shares of common stock.

4. Pan American has the additional option of buying up to 250,000 National shares, at $22.50 each, dependent upon high load factors being achieved by National with their leased jet transports. This option is available for two years from July 1, 1959. If a load factor of 80% is achieved, at standard fares, Pan American can take up the full option; smaller load factors will entitle fewer shares, down to none for a 50% factor or below. If National charges extra fares on the jets, alternative conditions apply to this purchase of extra shares.

If the deal is ratified, National will have the use of (probably) two of Pan American's Boeing 707-121s before the end of the year. Tentative plans have been made to start a daily non-stop service on the New York-Miami service on December 10, increasing to two and possibly three later. National would thus become the first U.S. domestic operator to use jet transports, since American Airlines have just announced a January 11 starting date for their transcontinental 707 service. On the route to Miami, National will be in competition with Eastern Airlines, flying Electras, and Northeast with DC-6Bs. The 707s will carry Pan American markings in the present season, but the agreement provides for the leased aircraft to carry their operator's markings in the future. Each airline will provide its own crews.

In the 1959/60 season and beyond, Pan American will be able to lease either 707-321s or DC-8s to National. (The six 707-121s will probably be sold by P.A.A. as soon as the bigger Boeings are delivered.) National has on order six Douglas DC-8s, for delivery in the latter half of 1959, and 23 Lockheed Electras with delivery to begin next spring.

Apart from placing National in a very strong competitive position in the coming winter season, the proposed deal is of particular note for the way in which it gives Pan American an interest in U.S. domestic operations. The initial exchange of stock will give Pan American 25% of National's authorized share total, while National will hold 4% of the authorized Pan American total.

This aspect of the deal is one which will be closely examined by C.A.B., whose reactions were not known at the time of going to press. The two airlines have asked C.A.B. to rule that the deal does not constitute acquisition by either airline of control of the other; but if the C.A.B. rules otherwise, they have asked for such control to be sanctioned. It seems likely that some airlines may also make representations to C.A.B. about the Pan American entry into the domestic field, and that a hearing into the proposal will need to be held.

The deal is interesting, too, as a possible working example of the arrangement suggested by the ICAO Air Transport Committee's recently published study ("The Economic Implications of the Introduction into Service of Long-range Jet Aircraft"—see THE AEROPLANE of July 11, this year, p.57). In paragraph 63 this report comments:—

"The problem of maintaining satisfactory utilization figures for both aircraft and crews on routes of low density and the relatively high price of long-range jet aircraft may accentuate the desirability of arrangements between airlines for the interchange of aircraft and crews and for the pooling of maintenance resources and other ground facilities. Airlines may co-operate with each other in the training of air crews and maintenance personnel for the new aircraft, possibly pooling such expensive training facilities as flight simulators. . . ."

Airways Modernization

DETAILS of the programme for purchasing new air navigation and air traffic control facilities in the fiscal-1959 year have been given by Mr. James T. Pyle, the Administrator of Civil Aeronautics. A total of $175 million is to be spent on establishing air navigation facilities, in the largest annual programme of its kind in the agency's history.

The programme provides for five long-range radar units to be installed at C.A.A. air route traffic control centres, and facilities for information from 11 existing or planned military radar units to be micro-waved into C.A.A. centres. Another 19 airport surveillance radars (ASR) will be installed and the programme includes airport surface detection equipment (ASDE) for the first time, with plans for 10 control towers to be so equipped. For the long-range radars, 42 beacons will be provided, plus another six for use with ASR.

Other items in the programme are 19 new ILS installations; 23 new control towers; relocation of 10 air route traffic control centres; installation of 62 VORTAC short-range navigation systems; and integration of 150 existing VORS with TACAN to

COMET AT KAI TAK.—The first production Comet 4 comes in to land at Kai Tak Airport for its recent visit to Hong Kong when the new runway was officially opened. The Comet is landing after an approach from the more difficult north-west direction, which involves a gentle turn to avoid high ground north of Kowloon before the final straight-in approach.

make VORTAC stations. A total of 13 airports will be equipped with terminal-type VOR systems.

High-intensity approach-light systems are scheduled for 73 airports, and the Sylvania Strobeacon system for seven airports. Special items in the programme are an air traffic control operational analysis simulator for the C.A.A. Technical Development Center at Indianapolis (cost $3,235,000); extension of the runway at Wake Island; and rehabilitation of the airport at Nome, Alaska.

TEAL's Re-equipment Policy

FINAL agreement between New Zealand and Australia has been reached on the re-equipment of TEAL, which is jointly owned by the two Governments. In talks between N.Z. civil aviation officials and the Australian D.G.C.A. (Mr. D. G. Anderson) the following main points were confirmed:—

TEAL's new aircraft will be three Lockheed Electras, all excess capacity of which will be chartered by Qantas, which has already announced an order for four Electras. The New Zealand airline will set up completely self-contained maintenance and overhaul workshops for the Electras [illegible] Australia will assist financially with any airport problems posed by the Electras in New Zealand. Although no official ver[illegible]ion has been given, it is still assumed that Australia will be [illegible] half the loss on TEAL's Coral Route to the south-east Pacific islands.

The only change in the terms of the agreement as previously reported seems to be that Qantas will operate from Melbourne through Auckland to Fiji under charter to TEAL. It was previously thought the two airlines would operate a parallel service through Auckland from Sydney. The new Qantas service is likely to be inaugurated before next winter's off-season with Super Constellations, which will be used until the Qantas Electras become available late in 1959. TEAL directors are reported to have agreed, after exhaustive examination, that Electras were the best commercial proposition for the airline. Standardization with Qantas, plus the charter agreement, meant that TEAL would be placed in the most favourable economic position to face the future.

DC-8 Simulator

TWO examples of the Link flight simulator for the Douglas DC-8 are now in use and another six are in production. This electronic full flight simulator, which was demonstrated recently at the new Douglas Jet Training Center at Long Beach, has several novel features, of which the most interesting is the provision of visual representation of approaches and take-offs. With the equipment, Douglas have become the first aircraft manufacturers to use a simulator, and the fact that it was functioning before the DC-8 made its first flight is also unusual. The crew which made the first flight in the DC-8 had previously "flown" the simulator for 35 hours and all three members had experience of operating from each of the different crew positions.

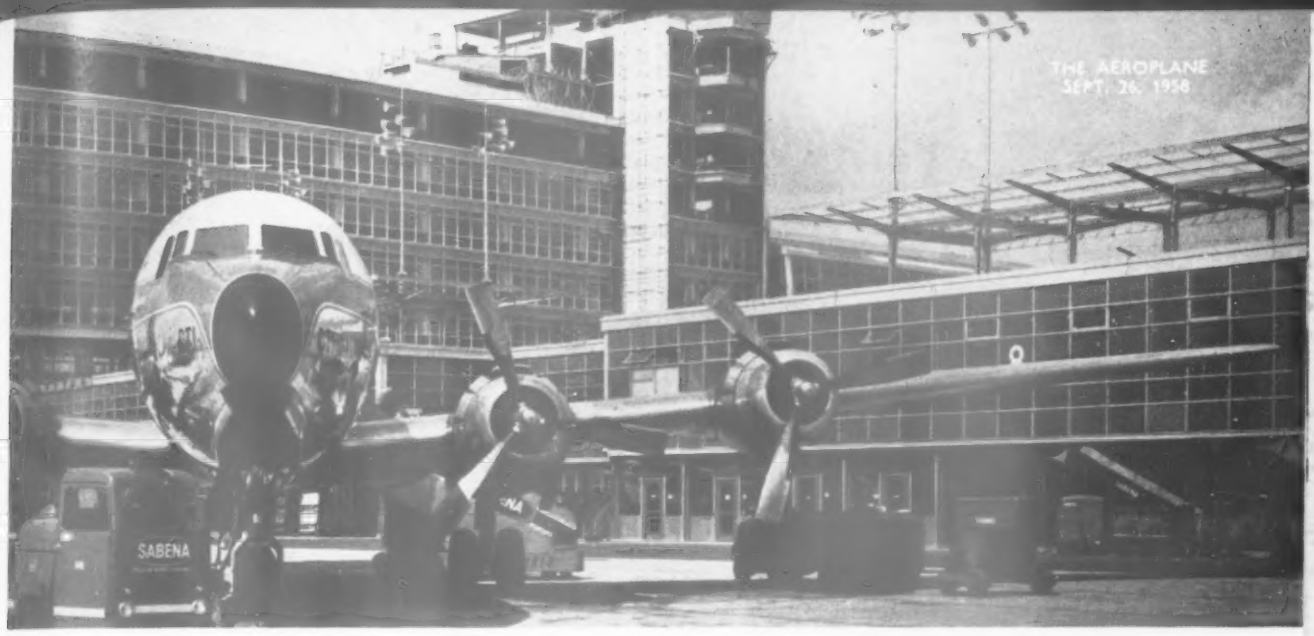
Visual presentation at take-off and on the approach and landing is achieved by use of a closed-link television circuit, the television camera scanning a 300 : 1 scale relief map of a typical piece of countryside and airport. The idea of this feature is to give a realistic impression, particularly of the approach speed and attitude, and it is not intended to provide approach training for specific airports. To do the latter, a whole range of these large and, one imagines, expensive maps would be required, one for every approach path.

Apart from this feature, which was conceived by Dr. W. B. Klemperer, a Douglas research engineer, the DC-8 simulator is typical of modern electronic devices of this kind, having a fully representative cockpit and reproducing exactly all flying conditions from take-off to touchdown. In addition to Douglas, seven airlines have ordered the DC-8 simulator from Link, comprising United, Eastern, S.A.S., K.L.M., Alitalia, Japan Air Lines and T.C.A. The United simulator went into operation at that company's Denver training centre on September 9 and was the sixth flight simulator to be installed there.

It is claimed that this equipment is the first to be built for a commercial jet transport. While this may be so, it is worth noting that B.O.A.C. have recently modified their Stratocruiser simulator to be representative of turbojet operations pending completion of the Redifon simulator for the Comet 4.

At the S.B.A.C. Display this month, the R.A.E. demonstrated its pilot's view simulator, which, although built for laboratory use, could be used to produce a similar result in a simulator, but does not call for the use of relief maps. In this system, a picture of the ground below is produced by a mechanically controlled optical system, and this picture is then viewed by a TV monitor.

These pictures of the DC-8 simulator show, left, the pilot's view of the runway and, below left, the relief map which is scanned by a television camera. The whole cockpit of the simulator in use with United Air Lines is shown below.



Brussels National Airport

A NEW passenger terminal was opened at Brussels National Airport on June 29, in time to handle the peak traffic for the Universal and International Exhibition. It is part of a larger airport modernization programme scheduled for completion by 1960. The airport has been renamed Brussels National, as the new terminal is now far from the village of Melsbroek which gave its name to the airport when it was constructed after the War.

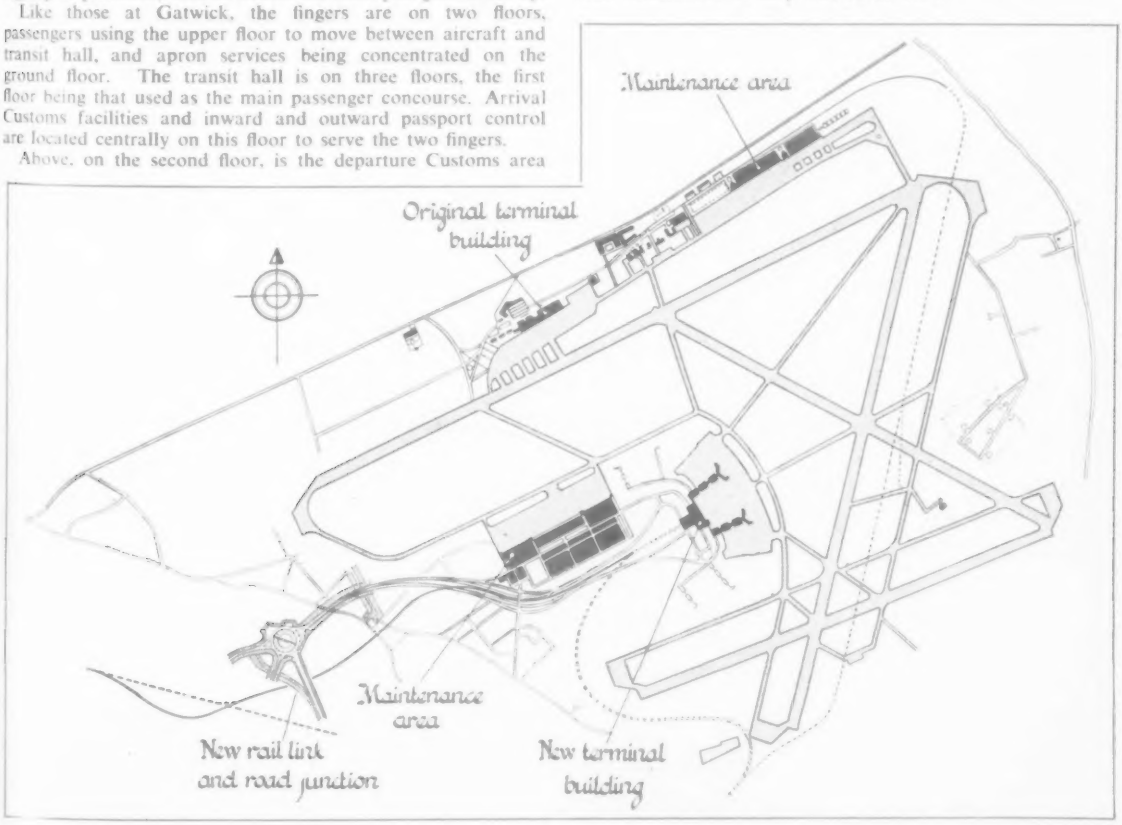
The location of the new terminal in relation to the runways is shown in the accompanying diagram. As will be seen, the new building has two parallel "fingers" extending from the central block, provision having also been made for the addition of two more fingers on each side later. Each finger serves eight gate positions, with an additional helicopter gate at the tip.

Like those at Gatwick, the fingers are on two floors, passengers using the upper floor to move between aircraft and transit hall, and apron services being concentrated on the ground floor. The transit hall is on three floors, the first floor being that used as the main passenger concourse. Arrival Customs facilities and inward and outward passport control are located centrally on this floor to serve the two fingers.

Above, on the second floor, is the departure Customs area and baggage check-in section, plus facilities for casual visitors and friends of travellers. Additional apron services are on the ground floor of the transit building. The entire airside face of the 300-ft. long and 55-ft. high transit building is glass-fronted.

Close to the new terminal is a rail terminus for a new Diesel rail-car service which links the airport to the Central Station in Brussels in a journey time of 16 minutes. An escalator connection has been provided between the station and the adjacent air terminus.

The main N.E.—S.W. runway is being extended to 10,500 ft. for jet operation, and extensions are also being made to the other runways. The diagram shows the runways and rail and road connections as they will be in 1960.



AIR TRANSPORT AND THE STRATEGIC RESERVE

by
Air Marshal
Sir Robert Saundby

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The possession of an adequate strategic reserve, with the means of moving it quickly to any place where it may be required, is not a frill or a luxury. The White Paper "Report on Defence,"* which was presented to Parliament in February, 1958, says:—

"The widely dispersed nature of British military responsibilities makes it essential for the Army to maintain a strong Central Reserve supported by an adequate fleet of aircraft to carry reinforcements rapidly to any part of the World. A proportion of this reserve will be kept at a high state of readiness, so that it can be moved at short notice." This is an excellent precept, but it does not appear that we have made very much progress in putting it into practice.

It is probable that, for the next decade or so, the strategic reserve may be the hardest-worked part of our defence organization. The more successful the deterrent effect of Western longe-range nuclear power, the more certain it is that, if we have to fight at all, we shall be engaged in limited war against some act of Communist, or Communist-inspired, aggression.

The Soviet Union is, at present, doing too well in the cold war to feel very tempted to indulge in local wars, but there is not the slightest doubt that the Russians would resort to force if they could make further advances in no other way, or if a particularly tempting opportunity of military intervention should offer itself.

The attitude of Red China is more difficult to assess. They have less fear of global war than the Russians, perhaps because they are less realistic in their views on World affairs, and of their firm belief that China, with her vast area and immense population, is much less vulnerable to thermo-nuclear weapons than any other country. The existence of Formosa and the off-shore islands, under Chinese Nationalist rule, is a thorn in their flesh. In addition, they are angered by their continued exclusion from what they believe to be their rightful place in the United Nations. They are therefore even less predictable than the Russians, and their political influence and military power are rapidly increasing.

In these circumstances, the prospects of our becoming involved in limited wars are by no means remote.

For the last 25 years the Air Ministry has, very properly, been concerned mainly to give to our air defence and our air striking force the highest priority in aircraft, weapons and training. Since 1945 the most important thing has been to ensure against the outbreak of global war by building up the deterrent power of a long-range nuclear striking force, and if the danger of global war has receded, it is because the United States and this country have followed this policy.

Although it has been necessary to put first things first, we have by no means devoted to them too large a proportion of our resources. Our contribution to the deterrent and our air defences has absorbed rather less than 20% of our annual defence budget. We have thus somewhat more than four-fifths of our substantial defence expenditure available for the upkeep of what are still known as conventional forces.

In spite of this, it has been clear for some time that Communist successes in creating trouble in our overseas territories, combined with the results of past blunders in our foreign and colonial policy, have produced a situation in which our conventional forces—especially the Army—are barely sufficient for their tasks.

The Government's estimate that by 1962 an Army of 165,000 men—roughly half its present strength—will suffice is based on two assumptions. The first is that the disappearance of National Service will enormously reduce the training commitment and will permit the closing of many instructional establishments, and thus release a large number of regular soldiers at present employed in an endless routine of training recruits. The second is that by 1962 our military commitments overseas will have been substantially reduced.

The first assumption, as far as it goes, is sound. It is a matter largely within our control, and it should be possible to reorganize Army training in such a way as to produce a larger proportion of fighting units relative to the total strength. But, even so, there must be a considerable reduction in fighting power compared with our position today.

The hope that we can reduce our military commitments substantially during the next three or four years seems to rest on very slender foundations. Any further serious reduction in our NATO commitment would certainly encourage other countries to do the same. Since we have, even now, less than the minimum force considered necessary by SHAPE to force a Soviet concentration in order to break through our defences, any further reductions in the NATO land forces would vitiate the strategic concept on which the defence of Western Europe is based.

(*Continued on page* 493)

*Cmd. 363.

VIPER

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The decision of the Royal Air Force early in 1957 to pioneer 'all-through' jet training was made possible mainly by one fact; that there was in existence an aircraft and an engine which exactly met their requirements for the job — the Hunting Jet Provost powered by the Armstrong Siddeley Viper. Apart from the logic of 'all-through' jet training for jet age pilots, economy was an important factor in this new policy: and on this score the Viper's record passed scrutiny with flying colours. Here was an engine with a really high utilization rate — reliable, robust, easily serviceable. Today, Jet Provosts, powered by the Viper Mark 8 are now serving with the R.A.F.; their record under training conditions has been beyond reproach.

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(*Continued from page* 492)

We depend on being able to force a concentration of Soviet armies in order to enable us to use our short-range nuclear weapons effectively. Otherwise there is nothing to prevent a simultaneous Russian advance on a broad front, and the only weapon left to us would be the bombardment by long-range thermo-nuclear weapons of Soviet centres of administration and production. This would be bound to result in a thermo-nuclear holocaust which would cause immense damage and loss of life in Western Europe and this country, and probably by 1962 in the U.S.A. and Canada.

No substantial reduction, therefore, of our Army of the Rhine can be achieved without endangering the whole structure of Western European defence.

Cold-war Extensions

With regard to our other commitments, the Communists will see to it that internal unrest, civic violence and encroachment on our overseas territories will tie down the largest possible proportion of our military forces in police operations and frontier defence. It would be optimistic indeed to suppose that there is likely to be any letting up of the cold war in the foreseeable future. On the contrary, it is far more likely that the effects of many years of patient Communist propaganda and covert preparation will not only maintain the disorders and terrorism in places where they exist at present but will succeed in causing new outbreaks in areas at present relatively peaceful.

If this survey is correct, it means that even with the assistance from the Commonwealth that has been such a welcome feature of the post-War years, there will not be much left from which to form the strategic reserve. It is, therefore, unlikely to be substantial, and if there is any short-fall in the recruitment of voluntary long-service regulars, it may be very small indeed.

No Government, of whatever political colour, will wish to prolong any form of National Service beyond 1962. It follows, therefore, that we shall have to make the best possible use of the reduced all-regular forces at our disposal. Since we cannot hope to have available sufficient troops to provide the garrisons we should need to protect our interests and maintain law and order in all our overseas territories, we shall be compelled to safeguard the most important areas, and be prepared to move forces, at very short notice, to wherever they may be required. The emphasis must be on mobility, flexibility, and striking power.

The necessary mobility can be provided only by air transport, backed by a well-organized system of air bases.

It is most unlikely that the Communists will initiate military aggression in well-defended zones, in which we have adequate forces on the spot or within easy reach. They will be tempted to do so only in what appear to them to be exceptionally favourable circumstances. Our military task would be to halt such an aggression, and to regain any territory that might have been over-run.

Two very important considerations will increase the difficulty of this task. The first is the need to prevent the conflict from getting out of hand and developing into a full-scale war. To this end, we shall have to accept such restrictions on our military operations as the Government of the day may judge to be necessary.

Secondly, since such acts of aggression are certain to contain an element of surprise—and since 1945 we have shown a remarkable aptitude for being caught unawares—very rapid action will be essential. Every day that passes will reduce our chances of success and increase the size of the force needed to restore the situation. It is, therefore, of the utmost importance to organize the strategic reserve in such a way that it can be moved quickly—really quickly, since every hour will count—to the decisive place, and will be ready to go into action immediately on arrival.

A Place for VTOL Aircraft

In addition, we must be able to move at short notice any forces from other garrisons overseas which can, for the time being, be spared. And we must not only transport our forces by air to the scene of action but we must supply them by air after they have arrived.

The greatest weakness of the United Nations forces in Korea was their dependence on a road-borne system of supply. Time and again the enemy, using mountain tracks, worked round behind our troops and set up road blocks which cut our communications. When this happened, the U.N. forces were compelled to halt their advance and even, on occasions, to retire, until they learned to stay put and rely on air supply until the roads had been cleared.

What is now required is an air-lift that can operate all the time with direct-lift aircraft carrying supplies to the fighting troops from dispersed forward bases, and evacuating sick and wounded on the return journey. The forward bases should be supplied by long-range transports from depots outside the theatre of war.

For these purposes we shall need a really substantial fleet of long-range troop carriers and freighters, and the sooner we can replace existing types requiring long concrete runways by aircraft capable of short or vertical take-off and landing the better. We shall also need a sufficient number of small VTOL aircraft for forward supply and the evacuation of wounded, etc., for which purpose several existing types of helicopter would be suitable.

It does not seem to me that we have yet begun to treat this problem seriously. It cannot be emphasized too often that the whole idea of the strategic reserve will fail unless we have enough air transport to move it rapidly and ensure its supplies.

This air-lift must be the responsibility of Transport Command. As Lord Montgomery has said, "No nation could afford to give to one Service the amount of air-lift that Service would need at any particular peak moment in war. . . . If the air-lift organization is to be an organic part of an army, it will cost more than if it was under the air forces; and the army will never have enough." He went on to say that "an air-lift organization must be dovetailed into air operations: you cannot separate an air transport system from air operations."*

In my view, there is no aspect of our defence organization so much in need of attention at this moment as the provision of adequate military air transport. We are inclined to boggle at the expense, and to grudge money devoted to a non-combatant organization. And until we wake up to the fact that without adequate air transport our small strategic reserve will be practically useless, this attitude will persist.

The United States realized long ago the vital need for genuine mobility, and they maintain a very large Military Air Transport Service. It may be argued that they can afford to do so, while we cannot. But money is not the whole story and we may well consider whether, with our very small future Army, we can afford not to do so.

Full-strength Operation

For too long now our military air transport has been relatively neglected. We must cease to regard it as a luxury, as something superimposed on our time-honoured methods of sea and land transport. We must realize that it should be a very important and fully integrated part of our defence organization.

This means that it must be fully used in peace-time, and not regarded merely as an unusual means of transport in a time of emergency. It has been officially stated that, at any given moment, an average of 10% of the Army is non-effective, because it is in transit from one place to another. In a small Army of 165,000 we cannot afford to have 16,500 men permanently non-effective as a result of our out-of-date methods of transport. What is needed is a definite decision that all movement of men and women of all three Services, posting, reliefs, and leave, to and from overseas and between overseas garrisons, is to be carried out by Transport Command, assisted when necessary by chartered civil aircraft. More should be done to support and encourage the independent operators of civil air transports, in view of their value as a reserve in time of need. In addition, Transport Command should be worked to capacity carrying Service supplies, especially valuable technical equipment, throughout the length and breadth of the Commonwealth and Empire.

We should persuade the Commonwealth countries to contribute units to the Command, and we should do all that we can to maintain and extend our system of air bases.

The serious deterioration of our position and influence in the Middle East, and the loss of military facilities in India and Ceylon, are certainly making it more difficult for us to maintain our former system of air communications. Recently, when Israel made difficulties about our traversing her skies with our airlift to Jordan, we were almost helpless.

But that is a compelling reason for organizing alternative routes, so as to preserve the cohesion of the Commonwealth and Empire. We need an organized air route via Gibraltar, West Africa, French Equatorial Africa, the Belgian Congo, Uganda, Kenya, Aden to Arabia and the Persian Gulf, and via Gan in the Maldive Islands to Singapore and the Far East. The sooner this is put in hand the better.

It is hard to understand why there is not a greater sense of urgency about these matters. Perhaps the realization that, after 1962, we shall have to make the best possible use of our small Army of 165,000 men will, before long, bring home to those responsible the need for providing military air transport on a genuinely adequate scale. But if we are to repair our present deficiencies by 1962, it is already later than we think.

* *R.U.S.I. Journal*: November, 1954.

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The need for extending the defensive range of aircraft-carrier task forces is met by the Fairey Gannet AEW.3 (3,875-e.h.p. Armstrong Siddeley Double Mamba 102 turboprop) airborne-early-warning aircraft, which is in production. This aircraft is to replace the American Douglas Skyraider, which has been in service with the Royal Navy since 1953.

Photograph copyright "The Aeroplane"

ROYAL NAVY

AIR TRANSPORT AND THE STRATEGIC RESERVE

by
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Sir Robert Saundby

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Photograph copyright "The Aeroplane"

ROYAL NAVY

Aeronautics International in Madrid—2

By J. R. Cownie, B.Sc. (Eng.), Grad. R.Ae.S.

AN initial survey of the lectures at the First International Congress of the Aeronautical Sciences in Madrid was published in THE AEROPLANE last week. Summarized below are some of the interesting points made in papers on astronautical propulsion, re-entry cooling, VTOL and STOL, boundary-layer control, materials and autopilots.

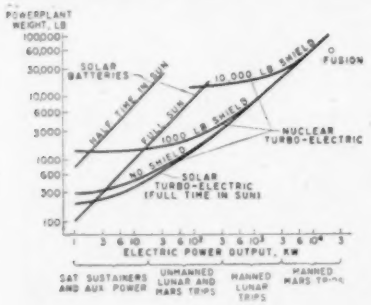
* * *

ASTRONAUTICAL PROPULSION.—The three basic performance parameters for space propulsion systems are specific impulse, thrust-to-weight ratio (or initial acceleration) and specific powerplant weight. The first two parameters decide the trajectory followed by a space vehicle in any gravitational field; a system with high specific impulse but low thrust may require more propellent for a given mission than one with lower specific impulse but higher thrust. A low-thrust system must thus have a considerable margin in specific impulse to make it superior to a high-thrust system on the basis of propellent consumption alone.

The third parameter is the powerplant weight divided by the jet power produced. This parameter is particularly suitable for electric propulsion systems, for which weight is in many cases almost directly proportional to electrical power output. The parameter in this case includes any inefficiency in the conversion of electric power to jet power.

There is a wide variety of non-chemical propulsion systems which might be feasible for high-payload space missions. These can be conveniently divided into three groups.

The first group consists of systems



These weights have been estimated for a range of electric power generators which may be suitable for astronautical propulsion. Electrical power so generated is converted to jet power by accelerators which may have efficiencies of 70% or more. The weight of the accelerator must be added to the generator weight shown to give the overall propulsion-system weight.

whose specific impulse is limited by material temperatures. Perhaps the most promising of this type is the nuclear-fission heat-exchange rocket. This may achieve a specific impulse of 1,500 sec. and have a specific weight of 0.001 to 0.004 lb. per jet kilowatt, which is similar to the weight of high-thrust chemical rockets.

Systems in the second group also rely on heating the propellent, but their specific impulse is not limited by material temperatures. The heated propellent is kept away from solid surfaces by magnetic or other force fields. These systems are all theoretically capable of specific impulses in the range of 10,000 sec. or higher.

Four propulsion systems in this second group are the thermo-nuclear rocket, the gas-phase nuclear-fission rocket, and rockets depending on electric-discharge heating and electro-magnetic induction heating. The feasibility of the first two has not yet been established. The electro-magnetic induction system looks attractive from the viewpoint of endurance and reliability because it does not have the electrode heating and erosion problems of the electric-discharge system. With the induction system it appears that electric power may be converted to jet power with an efficiency of 70% or more.

In the third group of propulsion systems the acceleration process is by electric or magnetic means rather than by thermal energy. All systems in this group are theoretically capable of specific impulses of 10,000 sec. or more. Their relative value will be decided by the efficiency of conversion of electric to jet power and their reliability for long-duration operation.

Most of the weight of the powerplants which use electric power is in the power-generating equipment. Inefficiency in conversion of electric to jet power is directly reflected in the weight and size of the generating equipment. The weight of the accelerator thus tends to be secondary to its efficiency.

Advantages of these non-chemical systems can be shown by considering a round-trip expedition to Mars, which would require a total initial payload of 200,000 lb. If the journey started from an orbit around the Earth, the initial weight required in orbit would be some 6.5 million lb. if a four-stage chemical rocket were used with a specific impulse of 300 sec. and a structure and motor weight of 5% per stage.

With a nuclear heat-transfer rocket of 800-sec. specific impulse, a thrust-to-weight ratio of 1.0, a tankage weight equal to 8% of the propellent weight and a powerplant weight of 50,000 lb., the initial weight in orbit would be about 600 000 lb. This could be reduced to 400,000 lb. if an electric propulsion system were used with a specific powerplant weight of 10 lb./kW. and an initial acceleration of 10^{-4} *g*. (W. E. Moeckel—Propulsion Methods in Astronautics.)

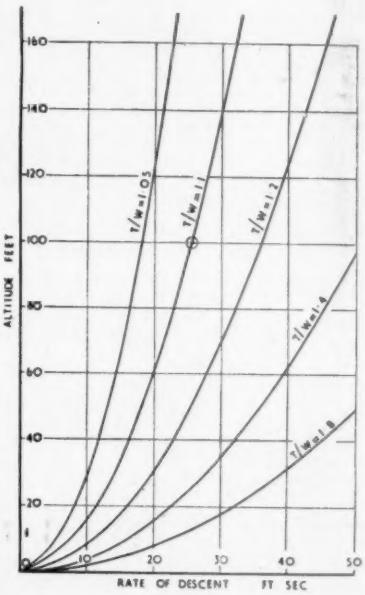
RE-ENTRY COOLING.—*There is a considerable reduction in the conductive heat flow to the skin of a vehicle if mass transfer cooling is used.*

In a film which accompanied Eckert's lecture the value of ablative mass-transfer cooling was demonstrated convincingly. Model re-entry bodies, conical in shape with a rounded apex, were subjected to a plasma gas flow at 20,000° C. and a speed of 3,600 ft./sec. Identical bodies made of aluminium, copper, stainless steel, nylon, linen bakelite and graphite were tested. In the hot gas flow the metal bodies melted rapidly and lost their shape, lasting only about 19 sec., but those of nylon, linen bakelite and graphite withstood the flow for more than 30 sec., maintaining their shape but gradually being worn away. The success of these somewhat unlikely materials was attributed to ablative mass-transfer cooling. (Ernst R. G. Eckert—Mass Transfer Cooling, a Means to Protect High-Speed Aircraft.)

VTOL SAFETY AND RELIABILITY.—For all-weather operation of a lifting-engine VTOL aircraft an autostabilizer appears to be essential. For a passenger aircraft it is advisable to quadruplicate the autostabilizer system.

There are two aspects of the weather problem; these are, operation in limited or zero visibility, and operation in high or gusty winds. It is suggested that in both respects VTOL has advantages to offer over existing aircraft.

Perhaps the most significant control problem of a VTOL aircraft is control of



This graph gives the maximum rate of descent for jet-lift VTOL aircraft if touchdown is to be at zero velocity. The curves are for engine-thrust values respectively 5, 10, 20, 40, and 80% greater than the landing weight of the aircraft.

altitude and vertical velocity in hovering flight. A balance must be struck between the penalties of restricting the rate of descent and of providing additional thrust so as to allow higher rates of descent. In general a margin of thrust over weight of about 10% is needed to give enough vertical deceleration for touchdown in calm conditions and greater thrust may be necessary in gusty air. A thrust margin of 15-20% is thus desirable. This margin applies to the maximum landing weight. It is also essential that the pilot should have an instrument display which gives his height and rate of descent clearly and accurately.

The high fuel consumption of VTOL aircraft in hovering flight means that careful consideration must be given to landing allowances for diversion, stand-off and error correction. It is suggested

(*Continued on page* 497)

(*Continued from page 496*)

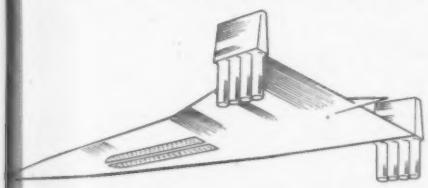
that no diversion allowance be made for civil VTOL aircraft; they must be designed for safe operation without equipping them with the wing area, flaps, brakes and undercarriage necessary for conventional landing on runways. No diversion should be necessary except, perhaps, when operating into city centres.

Stand-off allowances for VTOL aircraft could be taken as half those for conventional types, because there should be less congestion and landing delays at VTOL bases. For correction of errors in position, it is suggested that 1½-2 min. at hovering thrust be allowed. Even this small allowance is quite a severe penalty on a jet-lift aircraft; it may amount to about 3% of the take-off weight.

It is not enough to develop the aircraft, the engines and the control system. We must at the same time develop airworthiness requirements and blind-landing aids and techniques. Moreover, we must face up to the full implications of flying an aircraft whose lift and control are wholly dependent on engines and automatic electronic equipment for part of every flight. Without all this we may find that we have the aircraft but not the means of using it. (D. Keith-Lucas—Safety and Reliability Aspects of VTOL.)

U.S. VTOL AND STOL STUDIES.—*Many widely differing types of VTOL and STOL aircraft are receiving attention in the U.S. at present. It may appear that effort is being spread too thin to accomplish very much with any one type, but the present approach was chosen deliberately to provide limited information on a wide variety of configurations in a short time. This will allow early decisions to be made on the proper direction for major U.S. effort in the VTOL-STOL field.*

The NACA has undertaken a research investigation on supersonic VTOL transports using vertical-lift jet engines. Tests of promising configurations will be made with flying models; a model similar to the Rolls-Royce slim-delta project is under construction and will be flown soon. It represents a 400,000-lb. 150-passenger Mach-3.5 transport, with 90 small lifting engines along the fuselage and two packs of four larger engines at the wing tips. Unlike the Rolls-Royce configuration, the main propulsion engines tilt so that they can be used for hovering as well as for forward flight. (John P. Campbell—Research on VTOL and STOL Aircraft in the U.S.)



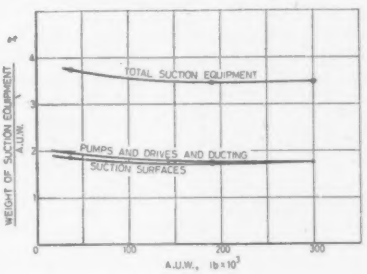
NACA tests will soon begin with a model of this supersonic VTOL transport which is described below.

LAMINAR-FLOW AIRCRAFT.—*Laminarization is no panacea for all aircraft. It comes into its own where the emphasis is on long range for military or civil transports and where operation at a high cruising altitude is permissible.*

Drag reduction by boundary-layer control can double the effective lift-to-drag ratio of conventional large transport aircraft, and L/D ratios of 40 or more are possible. This assumes that boundary-layer control is applied to the wing, tail unit and engine nacelles of aircraft which have aspect ratios of 8-11 and operate at high subsonic speeds with lift coefficient restricted to 0.3-0.5.

For a given range and payload a laminarized aircraft can be smaller and lighter than a conventional one. Alternatively, for a given range and all-up weight, payload can be increased and operating costs lowered. For a 300,000-lb. transatlantic aircraft the direct operating cost will be 42.5% less. Another effect is that for a given all-up weight and payload a laminar-flow aircraft will have much greater range than a conventional one.

The reduction of all-up weight because of improved L/D ratio has important implications for nuclear-powered aircraft, in whose design weight is the major problem rather than range or endurance. For nuclear aircraft there is a minimum design weight at which no payload can be carried. This minimum weight, which is large by the standards of current aircraft, depends on reactor power density,



The weight of suction equipment s shown here for a range of laminar-flow aircraft which have been studied by Handley Page, Ltd.

reactor shield weight and the L/D ratio of the aircraft.

The L/D ratio decides the reactor power required and thus also the reactor shield weight. By doubling the L/D ratio of a 600,000-lb. nuclear aircraft its payload could be increased from 8,000 lb. to 60,000 lb. after making allowance for the weight of laminarization equipment. (Dr. G. V. Lachmann—Fundamental Design Problems of Aircraft with Boundary Layer Control for Maintaining Laminar Flow.)

FORWARD-FACING FLAP.—*Supersonic aircraft have thin wings with highly curved or sharp leading edges. If no special measures are taken the low-speed performance of these wings tends to be poor because of flow separation from the leading edge as the lift coefficient is increased above low values. The separation is responsible for low values of maximum lift, large drag, poor controllability and buffeting.*

A method of exploiting this leading-edge separation rather than suppressing it has been studied. The flow is allowed to separate from the leading edge and boundary-layer control is used to make it reattach and remain attached to the upper surface of a forward-facing flap mounted above the wing. Thus a flow is established around a very thick pseudo wing which has good low-speed properties.

The forward-facing flap has a single blowing slot in its leading edge. Experimental results show that large lift can be obtained for moderate blowing quantities and total drag is not large. It is suggested that a forward-facing flap could be used to increase the lift and decrease the drag of a slim-delta wing. (D. G. Hurley—The Use of Boundary-layer Control to Establish Free Stream-line Flows.)

Types of flap proposed for high-speed aircraft. A blowing slot at the flap leading edge induces flow which has separated at the wing leading edge to reattach to the flap. The wing and flap then act in effect as a very thick high-lift aerofoil section.

MATERIALS.—Rocket requirements have focused attention on high-melting-point metals such as molybdenum, tungsten, tantalum and niobium. So far the higher-temperature shorter life requirements of the rocket have not noticeably benefited the aero gas-turbine. But great promise is seen for molybdenum-base alloys for service at over 1,000° C. (D. A. Oliver—Heat-resistant Materials—A Survey of Some British Developments.)

* * *

The trend away from structural safety *ad infinitum* is accelerating because of the high temperatures which accompany supersonic and hypersonic flight. These make it impossible to build structures for anything but a finite lifetime. At moderately high temperatures creep sets in and causes rupture in tension and buckling in compression, even under relatively small loads if they act long enough. (N. J. Hoff—Structures and Materials for Finite Lifetime.)

AUTOPILOT TRENDS.—*A conventional autopilot must have enough authority over the flying controls to give satisfactory performance, while aircraft response to any autopilot malfunction must not exceed specified limits. These requirements are mutually opposed; an uneasy compromise has been reached on current aircraft, but the problem becomes more difficult with greater ranges of operating Mach number and altitude. The position can easily be reached when the autopilot must labour all its life under restrictions which limit its usefulness considerably. The safety problem on the new generation of civil transports is going to be extremely formidable.*

This safety problem could partly be met by a duplex installation, but this would involve an unacceptably high failure rate. A triplicated multiplex system overcomes the failure rate which is inherent in the duplex installation and also makes possible non-scheduled automatic landing at a high level of safety, provided that radio guidance equipment is developed with an equally satisfactory overall failure rate. If it becomes necessary to base an operation upon the certainty of certificated automatic landing, then the choice will inevitably be to install a quadruplicated multiplex installation with the appropriate radio guidance equipment to match it. (A. M. A. Majendie—Some Considerations of Safety in Automatic Flight Control.)

Applying Aircraft Technology

THE Normalair company has long specialized in the pressurization and air conditioning of military and civil aircraft and can establish most conditions of flight by testing the aircraft systems in altitude chambers; the air supply tapped from the aircraft jet engines is simulated by supplying air from large compressors, and the altitude conditions are provided by large vacuum pumps which can simulate heights up to about 100,000 ft.

With this background of development it is possible to offer cabin pressurization, flow control, temperature control, humidity control and oxygen breathing equipment exactly suited to the severe conditions that will be met in flight.

Normalair's current development programme, in which their resources of power are being applied to full-scale heat-transfer experiments on nuclear-reactor components, shows how existing development facilities can immediately be used in the nuclear energy and other fields.

An illustration of the potential of such laboratory work is demonstrated by the latest Normalair altitude chamber, in which full-scale testing of aircraft and missile-cooling systems can be made. In this chamber can be simulated the effect of the increase of ram-air temperature at high Mach numbers on aircraft and missile skins, and at the same time it is possible to operate and prove the internal cooling systems to ensure that personnel or radar and radio equipment are unaffected by the extreme external heat loads applied at such speeds.

The new Normalair high-altitude/high-temperature chamber has a volume of 7,500 cu. ft., and is 42 ft. long with a clear internal diameter of 15 ft.; it can be supplied with air at flows up to 335 lb./min. and pressures up to 230 p.s.i.g. The temperatures of the supply air vary from +2° C. to 550° C., with ability to establish static ambient chamber conditions down to −45° C. The chamber can be fitted with infra-red heating to simulate the aircraft skin conditions encountered at speeds up to three times that of sound, a process calling for 300 kW. of electrical energy. Altitude chamber air flows as high as 60 lb./min. at an upstream altitude of 60,000 ft. can also be provided, a maximum rarefied air flow of 440 lb./min. being possible against an upstream altitude of some 25,000 ft. To provide such facilities a very large compressor and exhauster power house are required, some 4,000 h.p. being available.

The laboratory is equipped with other altitude chambers ranging from 3,000 to 450 cu. ft. in volume along with the necessary power backing, instrumentation, and subsidiary equipment necessary to allow the company first to develop thoroughly and finally test all the systems covered by the broad heading of aircraft air conditioning.

In the testing and development of such aircraft equipment there is a direct parallel with similar cases in the fields of industrial air conditioning and process control, and it is obvious that the application of such facilities could virtually guarantee the functional efficiency of the system and its components. It has always been necessary in the aircraft industry to prove equipment under conditions of vibration, acceleration, climatic and ambient temperature variation, pressure (both positive and negative) and contamination by dust, bacteria or other foreign matter. Normalair accordingly have vibration rigs of all kinds, climatic cabinets for testing from −85° C. to 120° C. (with 100% humidity), acceleration rigs providing up to 26 *g*, pneumatic and hydraulic pressure sources up to 4,000 and 10,000 p.s.i.g. respectively, high-vacuum rigs down to a nominal 10^{-8} mm. Hg, as well as fungus-growth cabinets, methelyne-blue particulate testers, and whirl rigs which can assess rotating parts up to 110,000 r.p.m., and special leak testing and out-gassing test equipment.

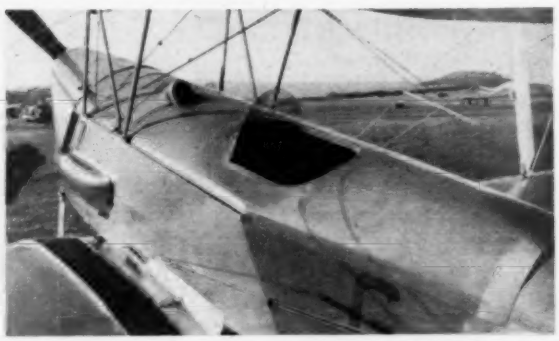
The conclusion to be drawn from this survey of Normalair's facilities is that the laboratory, coupled with the very special staff and the considerable background of experience, will be of great importance when applied to the development of industrial equipment in this modern engineering era, and it is obvious that those facilities will have special application to the fields of nuclear, heat-transfer and chemical engineering.

Duster From Thruxton

THE four-seat biplane developed by Jackaroo Aircraft, Ltd., of Thruxton, Andover, from the D.H. Tiger Moth and known as the Thruxton Jackaroo seems to lend itself to almost infinite variety. Some time ago, when we dealt with the structural modifications of the conversion (THE AEROPLANE, November 16, 1956) and its flying capabilities (July 12, 1957), we referred briefly to a crop-spraying version.

The first production model of this agricultural aircraft has now been flown and tested. A commendable feature is its ready conversion back to the enclosed four-seater, extending its application so that it can be used as a tourer or trainer, or as a light transport; only an hour's work is necessary to bring about this conversion, including the removal of the special tanks and crop-spraying gear.

Both Allman boom-type sprays and Britten-Norman atomizers (one on each wing-tip) are fitted as standard for agricultural work, and either gear can be selected.



Photograph copyright "The Aeroplane"

For crop spraying duties the Jackaroo is equipped as a single-seater.

Priced at £1,615 (or £1,665 equipped), the Jackaroo crop-sprayer is probably the cheapest agricultural aircraft now available anywhere. It has the 130-h.p. D.H. Gipsy Major 1 engine, and is a rugged "hack" aircraft designed for reliability of operation rather than high performance.

The Venomous Vigilante

NORTH AMERICAN AVIATION'S A3J-1 Vigilante two-seat all-weather attack bomber carries its sting in the tail: bombs are ejected rearward from a tunnel, aptly termed a "linear" bomb bay, running along the rear end of the fuselage. It can be used to house nuclear weapons for delivery at great height and speed, and nuclear or high-explosive bombs at low level.

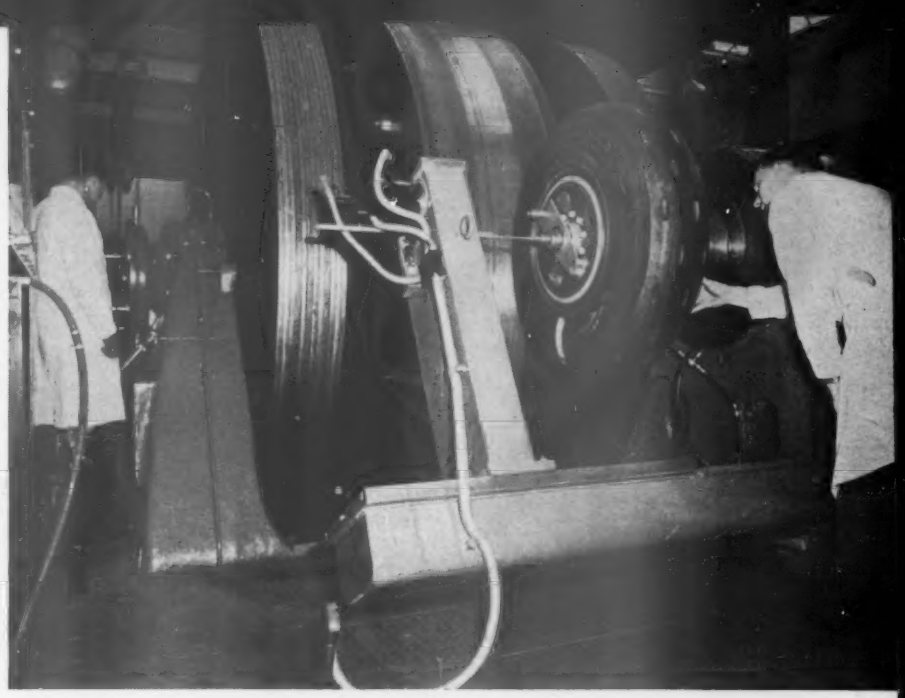
Features of the design are a high-set thin, swept wing and a very large mid-positioned slab tailplane. The wing leading edge starts at least half way along the fuselage from the nose and the trailing edge is only a little ahead of the tailplane, the resultingly short tail-moment arm requiring a large tailplane area. The fin is of relatively high aspect-ratio.

General Electric J79-2 15,000-lb.-thrust turbojets are mounted one on each side of the fuselage. A distinctive feature is the extended and raked forward upper lips of the intakes which contain adjustable wedges of Ferri type to produce the required intake shock-wave angles for various supersonic flight speeds.

Control surfaces are of interest in view of the fact that the Vigilante is a fairly large carrier-borne supersonic aeroplane. Spoiler-deflectors are used instead of conventional ailerons for lateral control. There are flaps at leading and trailing edges of the wings, the latter having blowing over them. Span is approximately 50 ft. and length of 70 ft. A3J-2 versions may have rocket boosters.

American reports have referred to the use of an inertial guidance system developed by the Autonetics Division of North American; and a bombing system consisting of Convair K-band radar, Eastman-Kodak visual bomb sight and an Autonetics computer. The "linear" bomb bay system is credited to Minneapolis-Honeywell.

Dunlop's Aviation Activities



A complete aircraft tyre, wheel and brake assembly ready for testing on the Adamson dynamometer.

EMPLOYING some 5,400 personnel, the Aviation Division of the Dunlop Rubber Co., Ltd., at Coventry, is well known for the tyres, wheels and brakes, pneumatic and hydraulic systems and rubber accessories that it supplies to the aircraft industry, civil operators and numerous air forces. In addition, the Division manufactures a wide range of smaller components for aircraft and missile systems, and operates a comprehensive servicing and repair organization.

At Coventry the establishment covers approximately 90 acres of workshops, test houses and offices, which include research and experimental sections besides production facilities. A school for training and instructing ground personnel in the maintenance and servicing of Dunlop equipment is also operated by the company.

Although it is not responsible for the manufacture of aircraft tyres, which are produced at Ford Dunlop, Birmingham, the Aviation Division undertakes the testing of tyre, wheel and brake assemblies and the supply of such components to the aircraft industry. It is nearly 50 years since the first Dunlop aircraft tyre was designed, and one of the prime activities of the company has been the continual development of tyres.

To meet this task a well-equipped test department has been built up at Coventry in addition to the Tyre Research Centre at Fort Dunlop. In this department the machines not only simulate all the contemporary working conditions of the individual components, but are employed on development studies for future requirements.

One such unit is a wheel-and-tyre vertical-load test machine which embodies a weightbridge between the hydraulic ram and the load table. The latter is adjustable to take various angles so that inclined loads of 15° and 30° can be applied to the wheel and tyre.

To investigate the causes of fatigue failures a number of machines using two wheel-and-tyre assemblies are employed. One of these assemblies is driven by an electric motor, and the other, the wheel undergoing test, is housed in a free-sliding yoke.

By means of a ram which is attached to this yoke the wheel is pressed into contact with the driving assembly, the load being varied according to the operating conditions on the wheel in service. The wheel r.p.m. is selected to simulate fast aircraft taxi-ing speeds; and loads of up to 20 tons can be applied.

An inertia machine employing a range of flywheels of varying weights up to a maximum of 8 tons driven by a 200-h.p. electric motor is used by Dunlop for brake testing. The brake unit under test is installed within the wheel with which it will be fitted on the aircraft. A flywheel of enough mass to develop the required kinetic energy at a calculated r.p.m. is fitted to the machine, and the test wheel and brake is attached to a shaft extension.

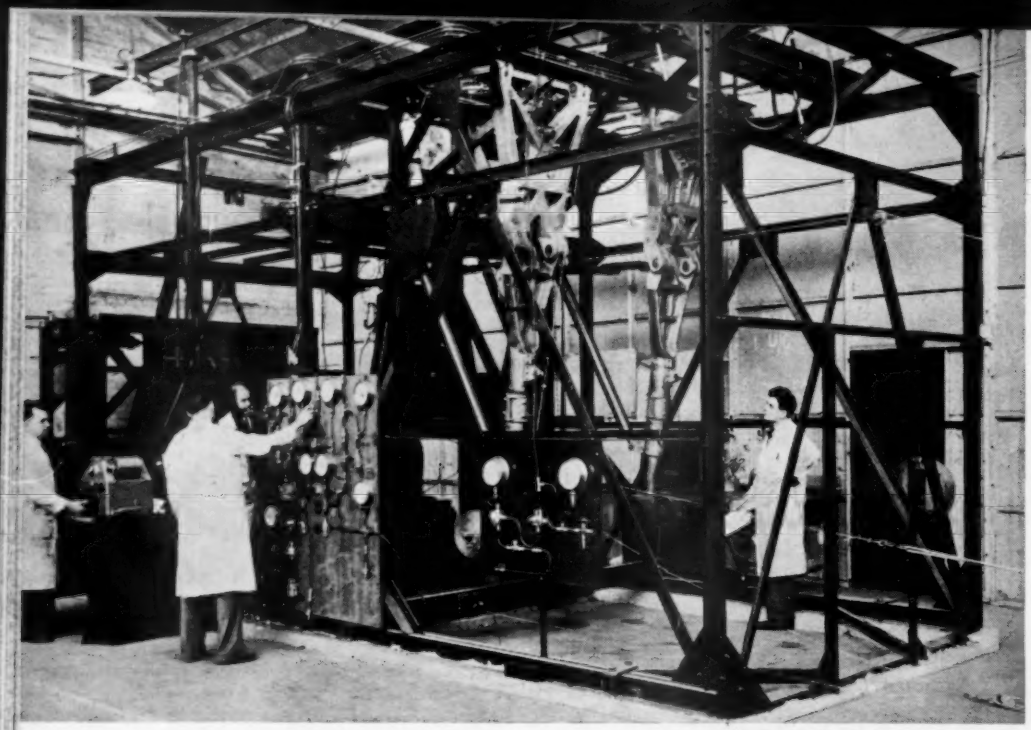
When the flywheel has been rotated to the required speed the motor current is cut off and brake pressure is applied until the flywheel has been brought to rest; during this period the temperature reached in various parts of the brake and the time factor are recorded.

The one shortcoming of this equipment is that it cannot test tyre, wheel and brake as a single unit, and to overcome this an Adamson machine has been recently introduced to test complete assemblies. Weighing 160 tons, the apparatus basically consists of a flywheel with two horizontal moving carriages mounted so that a test assembly can be brought into contact with the periphery of the flywheel on each side.

The standard weight of the flywheel is 10 tons, but this can be increased to 45 tons by adding a series of 30 plates to each side. It is driven by a 400-h.p. variable-speed DC motor through a two-speed gearbox and pneumatic clutch.

Controlled in movement by pneumatic rams, the two carriages are designed for testing tyres of up to a maximum diameter of 36 in. and 67½ in. respectively. The smaller carriage can be

Control panel of the Adamson dynamometer. The standard weight of its flywheel is 10 tons, but this can be increased up to 45 tons by adding a number of plates to each side—as seen in the photograph at the top of this page.



A rig used for testing components of the Fokker Friendship undercarriage.

loaded up to 20,000 lb. and the larger up to a maximum of 70,000 lb. At its maximum weight the flywheel can develop over 66 million ft. lb. of kinetic energy with a top speed of 560 r.p.m., which represents a ground speed of 200 m.p.h.

Two recorders are used to log tyre load, deflection, brake pressure, torque and so on. One is a six-channel cathode-ray oscillograph for recording rapid changes and the other incorporates eight pens writing on paper against a time scale to provide a summary of work done.

Brake Design and Development

Numerous developments in the aircraft industry have been applied to other fields and one of the best examples of this is disc or plate brakes. Now employed in industry, and used for heavy vehicles and production cars, their operating principles are based on aircraft brake design and development.

In 1945 the Aviation Division introduced a brake in which the steel drum in their original design was replaced by metal rings keyed into and rotating with the wheel, the friction pads being brought into contact with the rotating rings by operating pistons and cylinders.

Since that time the introduction of a new inorganic friction material has improved the braking power and energy capacity without increasing the overall dimensions of the disc brake. Steel segments located in rotor spiders to reduce distortion replace the earlier metal rings.

These rotor spiders and segments are located in a caliper formed by a brake plate, spacer and a circular torque plate in which five or more operating pistons or cylinders are located. When the cylinders are pressurized the friction pads are brought into contact with the segments by means of a thrust plate.

Another advance in aircraft braking has been the introduction of the Maxaret anti-skid unit designed to eliminate skidding and provide the most efficient braking torque. The unit consists of a valve regulated by a rubber-tyred flywheel that is rotated by direct contact with the rim of the main landing wheels. Excessive deceleration displaces the flywheel in relation to its rubber shell, and this operates the valve mechanism which releases the pressure in the brakes and stops the pressure supply until the wheels regain forward motion. The balance of flywheel and drum is then restored and pressure is again fed to the brakes.

To prevent the application of the brakes before the main wheels are rotating freely on the runway after touchdown, Dunlop have developed a "cocking" valve which may be used in conjunction with the Maxaret unit. Completely automatic, it is connected to the "undercarriage-up" line so that the brakes are applied until retraction is complete; the brake pressure is then released and the Maxaret unit is cocked ready for use on landing.

Producing approximately 60% to 70% of the Aviation Division's requirements, the machine shop at Coventry is divided into two sections—main production and prototype. In addition to containing the normal types of equipment the shop has a fully computor-controlled milling machine and produces high-tensile high-temperature steel rings by the cold circling and butt-welding process.

A Dunlop climate/stratosphere chamber which is capable of providing temperatures from—60°C to + 80°C.

Used for the production of gas-turbine rings, these high-grade steel rings have been manufactured in stainless steel, Nimonic 75 and 80A, and Fortiweld materials. In addition, experimental rings in chrome-molybdenum, Nimonic 90, titanium and Jete Hete M.151 have been produced. These rings are supplied ready for machining to within ±0.045 in. of the required internal circumference with a maximum ovality of ±0.040 in. between major and minor axes.

Aircraft and Missile Equipment

Divided into pneumatic, hydraulic and electrical components in the assembly shop, accessory equipment produced by the Dunlop Aviation Division covers the aircraft and guided-missile fields besides specialized aircrew requirements. Again, developments in aircraft pneumatic systems have been applied in other industries and one of the most recent examples is pneumatic suspension design for commercial road vehicles.

High-pressure pneumatic systems for aircraft services are now operating at storage pressures of 3,000 to 3,300 p.s.i., but future

(*Continued on page* 501

A section of the main assembly shop for components of the Aviation Division.

Part of the final inspection and test department for all items produced at Coventry.

(*Continued from page* 500)

systems are expected to be in the 6,000-p.s.i. range. To obtain the present-day requirements Dunlop have produced a number of compressors designed to store air at 3,000 to 3,300 p.s.i. One such unit has a four-stage supercharger operating at a boost pressure of 30 p.s.i. to deliver 5 cu. ft. of free air/min. pumping at 3,200 r.p.m. against a back pressure of 3,300 p.s.i.

In addition to undercarriage retraction and lowering, nose-wheel steering, and air-brake and flap operation, pneumatics are now being used in turbojet aircraft for engine control. Applications include electro-pneumatic valves and rams for operating thrust-reverser "eyelids" (Rolls-Royce Avon and Conway), variable nozzles and re-heat systems (Armstrong Siddeley Sapphire).

Guided-missile work by the company has produced components for the three main divisions of rocket design—propulsion, guidance and armament. For this particular field the requirements are for miniaturized units capable of milli-second response, and able to withstand acceleration forces that may be as high as 50*g*.

Originally designed for use on military aircraft fitted with ejection seats so that their shape offered the least possible obstruction, straight flying-control handles have been developed from the Dunlop range of ring or spade-type handles. All flying, armament and other controls in the form of electrical switches are housed in the upper end of the handle. These switches, developed at Coventry, are miniaturized and are of the single-pole snap-action type for such services as armament control, radio, and auto-pilot cut-out, and two- and four-way for flying control trimming.

One of the best-known applications of the Dunlop electrically heated mats for thermal de-icing is on the intake of the Rolls-Royce Dart. These heater mats, designed to give power loadings of up to 30 W./sq. in., have a maximum operating element temperature of approximately 150° C., their average weight being 0.35 lb./sq. ft. with a thickness of .075 to .08 in. Consisting of two thin layers of rubber sandwiching a heater element, the mats are normally bonded to a component during manufacture.

Other products of the Aviation Division include the Maxivue and Wylie windscreen wipers; methanol anti-icing systems for turbojet powerplants; flexible hoses for high- and medium-pressure systems, and a wide range of rubber accessories manufactured from natural and synthetic materials. One of the latest developments of the company is the Fleximet range of all-metal flexible pipes designed for working in positions where there are vibration or flexing in high ambient temperatures.

Backing up the production facilities of the company, and with its headquarters at Coventry, is the Aviation Repair and Service Department. Catering for all types of components this department has a large repair section within the Division's workshops, and handles approximately 7,000 items every month. In addition, there are a number of mobile working parties and engineers who work from fixed bases throughout the country.

It is estimated that the cost of development work for testing one aircraft component is equal to a hundred times the cost of the component. This calculation is well supported at Coventry where the experimental, research, production and type-test laboratories make up a considerable proportion of the company's effort.—P.R.R.

An electronically controlled milling machine in the machine shop at Coventry.

The Fighting Services

Leaving "Treble-One"

NEXT MONTH Squadron Leader Roger L. Topp, A.F.C., Commanding Officer and leader of the R.A.F. Hunter Aerobatic Team, completes his tour of duty with No. 111 Squadron and is to take up a staff appointment at Allied Air Forces Central Europe, Fontainebleau, early in the New Year. Given the command of "Treble-One" three years ago when it was equipped with Meteor 8s, he has built up the Squadron's team from three aircraft to its present maximum number of 22 and at the same time established an international reputation for precision formation aerobatics.

Joining the Service as a wireless apprentice in 1939, Sqn. Ldr. Topp started his flying career in Canada in 1943. When he returned to the United Kingdom after completing his training the following year there was a surplus of R.A.F. pilots, so he transferred to the Glider Pilot Regiment. In March, 1945, he flew a Horsa glider carrying troops and their equipment in the airborne crossing of the Rhine. Two years later he joined No. 89 Squadron operating Mosquitos in Germany, becoming a flight commander and Wing instrument flying examiner.

In 1950 Sqn. Ldr. Topp was awarded the Air Force Cross and took the course at the Empire Test Pilots School, Farnborough, where he remained on the staff of the Royal Aircraft Establishment. He became a leading aerobatic demonstration pilot on the English Electric Canberra, flying before the Emperor of Ethiopia and the Shah of Persia during their visits to Britain. In 1954, with another pilot, he shared the 100-hr. intensive flight-testing of the de Havilland Comet undertaken at Farnborough.

Sqn. Ldr. Topp was awarded a Bar to the A.F.C. in 1955 and, for his work with the aerobatic team, a second Bar in January of this year.

A.T.C. Chipmunk Pilots

FIFTY R.A.F. de Havilland Chipmunks will, by the end of this month, be delivered to 13 Service and civilian airfields for use by cadets of the Air Training Corps and air sections of Combined Cadet Forces in schools. Intended to provide the cadets with air experience, the aircraft will be flown by some 200 pilots specially commissioned during the past few weeks into the training branch of the R.A.F.V.R.

All of these newly recruited pilots are former R.A.F. and R.Aux.A.F. pilots and include commercial pilots now engaged with B.O.A.C., B.E.A., and some independent airline operators. There are also some instructors from civil flying clubs.

The 50 Chipmunks will be organized into 13 Air Experience Flights based at Cambridge, Biggin Hill, Southampton, White Waltham, Filton, Cosford, Woodvale, Exeter, Sydenham (Northern Ireland), Yeadon, Newton, Ouston and Turnhouse. Each unit will be commanded by a flight commander. The number of pilots will depend on the number of aircraft in the flight, which vary between 10 Chipmunks at Biggin Hill down to one at Sydenham.

So far the following flight commanders have been appointed: Newton, Flt. Lt. F. C. Taylor, of West Bridgford, Notts; Filton, Flg. Off. A. Shannon, of Bishopston, Bristol; Biggin Hill, Flt. Lt. F. D. Wolfson, of Ealing; Southampton, Sqn. Ldr. H. T. Elliot, of Fareham, Hants; Cambridge, Flt. Lt. J. P. Blackmore, of New Barnet, Herts; White Waltham, Flt. Lt. D. R. Baxter, of Maidenhead, Berks; Cosford, Flt. Lt. D. A. Scott, D.F.C., of Aldridge, Staffs; Yeadon, Flt. Lt. D. Shaw, of Leeds; Woodvale, Flt. Lt. F. A. Champman, of Hooton, Cheshire; Ouston, Flt. Lt. G. W. Marshall, of Sunderland.

Inter-Service Sports

THIS year the W.R.A.F. recorded its most successful season in inter-Service sports competition for 10 years, winning seven of the nine contests held between the W.R.N.S., the W.R.A.C. and the W.R.A.F. The athletics, cricket, hockey, lawn tennis, netball, small-bore rifle shooting and swimming championships went to the W.R.A.F., the W.R.N.S. taking the diving and fencing. The previous best year for the W.R.A.F. was 1948 when they won eight contests.

At Aldershot this year the W.R.A.F. won the athletics championship for the ninth successive time, scoring 55 points to the W.R.A.C.'s 51½ and the 37½ gained by the W.R.N.S. In winning the 1958 lawn tennis championship the W.R.A.F. recorded their eighth victory in the 12 contests held to date. One of the most exciting of this year's contests was the small-bore shooting championship, won from the W.R.N.S. by a single point, 1,561 to 1,560, with the W.R.A.C. scoring 1,535.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Wing Commanders: J. J. Barr to the Army Staff College, Camberley, for directing staff duties; A. H. Hewitt to R.A.F. Wildenrath, 2nd T.A.F., for technical duties; D. I. Pike, M.C., to Headquarters, Allied Air Forces, Northern Europe, for staff duties; V. Rees, D.F.C., to R.A.F. Biggin Hill to command London U.A.S.; K. Ritchley to R.A.F. Gaydon to command the Flying Wing; E. W. D. Roy, D.F.C., to Headquarters, 2nd A.T.A.F., as officer commanding the International Support Unit; P. G. Tyler to the U.S.A.F. Air Materiel Command for exchange duties; E. J. Watts, M.B.E., to No. 16 M.U. for technical duties.

Squadron Leader: *J. W. Hume to Headquarters, Bomber Command, for technical staff duties (with acting rank of Wg. Cdr.).*

Reunion

No. 85 Squadron.—The 13th annual reunion will be held at the Victory Ex-Services Club, London, on November 15, 1958. Tickets, price 14s., are available from Mr. J. Roberts, 60 Swanfield Road, Waltham Cross, Herts.

HUNTER LEADER.—As recorded on this page, Sqn. Ldr. Roger Topp, A.F.C., is leaving "Treble-One" next month on the completion of his tour of duty with the Squadron. This recent close-up shows him piloting one of the Squadron's black Hawker Hunter 6s.

Photograph copyright "The Aeroplane"

At Home to the Public

Last Saturday 34 R.A.F. stations were "At Home" to the public in connection with this year's Battle of Britain week. On this and the next page are brief reports from some 26 of these stations, giving a general account of the flying and static displays presented by the three Services, with additional help from a number of companies in the aircraft industry.

Acklington.—The "At Home" display took place in almost perfect weather. Local items included a skilful and impressive display by the Hunter 6s of No. 66 Squadron (Sqn. Ldr. P. Bairsto) and individual aerobatics by a Hunter (Flt. Lt. R. Passfield) and a Meteor (Sqn. Ldr. J. C. Steele). An amusing note was struck by a Sycamore helicopter of No. 275 Squadron, which trailed a "Man in the Moon" who repulsed an "Earth-launched satellite" destined for the Moon. The display was enjoyed by a record crowd of some 28,000 people.

Andover. — Film star Miss Anne Heywood opened Andover's flying display; some 10,000 people saw a varied flying programme which included a fine display by the Folland Gnat from near-by Chilbolton, some amazing slow flying by the Pioneers, which revelled in the stiff breeze, and a delayed parachute drop by Sgt. McArdle. Sgt. "Andy" Gough gave a brilliant aerobatic display in an Olympia glider and Cpl. Bill Longley flew a strut-and-wire primary glider through a series of sonic bangs with the aid of a Very pistol. In the exhibition hangar were modern guided missiles, a World War II German glider bomb, a Spitfire PR.19 and the Supermarine S.6B.

Bassingbourn.—The station was open to the public for the first time in 10 years, and a crowd of more than 20,000 was thrilled by a flying display which opened with a formation aerobatic team of four Meteors. A French Vautour from Cognac made many fast runs over the airfield. Later, flights by the three V-bombers, Javelins and Hunters kept the crowd excited, but the formation flying of four Bassingbourn Canberras led by Flt. Lt. Purcell and the aerobatic display of two Canberras flown by Flt. Lts. Carty and Colvin, Bassingbourn instructors, stole the show.

Benson.—Good weather greeted the display at Transport Command's ferry base at Benson. Although not conducive to spectacular flying, Benson aircraft managed to keep a large crowd well entertained. The Ferry Training Unit put up a formation aerobatic team of four Meteor 7s and Flg. Off. Hamer did evolutions with a single Meteor which were second only to the "Zura-batics." An interesting demonstration, possibly unique to Benson, was a Twin Pioneer display; the Ferry Unit has several of these aircraft for ferrying to the Middle East. Imaginative flying came from a Bassingbourn-based Canberra and a visiting Vulcan from Waddington, and nostalgia was aroused by a brief fly-by from a Mosquito T.Mk.3.

Biggin Hill.—This station, as usual, had the greatest attendance; more than a quarter of a million visitors were present. Highlights of the flying display, which lasted more than 2 hr., were a set-piece attack on a mock guided-missile site and aerobatic displays by the U.S.A.F. Skyblazers, No. 111 Squadron and Chipmunks of London U.A.S. Helicopter aerobatics were demonstrated by a team of Westland helicopters. Thirty companies exhibited in the static display and a great variety of aircraft models was on show. A model of the Black Knight attracted much attention.

Binbrook.—The high spot of a very fine afternoon's flying was probably the display given by the station's own No. 9 Squadron equipped with the Canberra B.6, the solo aerobatics and final "bomb-burst" being specially impressive. Various static demonstrations were always thronged, with much interest being shown in the aerial photographic display. During the precision bombing, the fort was brilliantly attacked and shattered.

Chivenor.—More than 14,000 visitors at this station, home of the Service's only day-fighter O.C.U., were not discouraged by the frequent heavy showers which did not affect an excellent flying programme. The flying display included aircraft ranging from the Spitfire and Mosquito to the F-100, Valiant and Vulcan; there was a parachute drop by Mr. Lewis from Roborough Aerodrome, Plymouth. Hunter formation aerobatics were demonstrated by three pilots from the unit. The station is the first in the R.A.F. to be equipped operationally with the Hunter T.7 and the public saw the new trainer put through its paces.

Church Fenton.—The flying display started with a dummy attack on an air-to-air gunnery target by a Meteor night fighter of No. 85 Squadron. The pilot of the "tug" aircraft, Flg. Off. "Ed" Durham, then performed aerobatics as requested by the public. Flt. Lt. "Bill" Shepherd later gave a polished demonstration of aerobatics in a Hunter 6 of No. 19 Squadron. An extensive ground display of aircraft and armament was centred on the station's own Spitfire.

Cosford.—Apart from fly-pasts, displays were given by several aircraft based at Cosford for the day. An Auster, a Devon, a Beverley, a Lincoln and a Sycamore were demonstrated. Aerobatics by a Vampire T.11 were followed by a Balliol demonstration. This aircraft was also used as a target for a height and airspeed judging competition. The static display included exhibits showing radar, wireless and photographic equipment on which boy entrants are trained.

Cottesmore. — More than 40,000 attended the first "At Home" held at Cottesmore for some years. The proceedings were opened by the Cottesmore Hunt. The main attraction was, of course, the Victor which has been in service with No. 10 Squadron since April of this year. It is difficult to highlight any particular event from the superb flying display, but certainly one of the most interesting items was the World War I mock dogfight between a Sopwith Pup and a Bristol Fighter. Both of these aircraft were from the famous Shuttleworth collection. Another popular attraction was a B.E.A. helicopter which gave trips to the public.

Photograph copyright "The Aeroplane"

The nine Javelins of No. 46 Squadron led by Wg. Cdr. F. B. Sowry, A.F.C., which followed the Hurricane and Spitfire over the City of London during last Sunday's fly-past.

The aircraft park at R.A.F. Chivenor. An O.C.U., the station is the first operational unit to receive Hunter T.7s, one of which can be seen on the right-hand side.

Halton.—The domestic flying display included an air race and formation drill by four Chipmunks; an Auster demonstration of Army Co-operation work; and a flying display by a Devon, including a height-judging contest for the public. The static aircraft display included Spitfire, Hunter, Swift, Javelin, Canberra, Meteor, Valetta, Provost and Chipmunk. There was a display of aircraft engines, of instrument navigation, aircraft electrical and aeronautical equipment. The grand finale was the drill display and the Apprentices' pipe band beating the retreat.

Honington.—Open for the second year in succession, and with two additional stations—one another V-bomber station—open in East Anglia, Honington's ground-display theme was "Bring the Family." The P.T. team from Cardington, the station's own police dogs, and the ceremony of retreat created great interest. Attendance was estimated at 22,000, 2,000 more than last year.

Horsham St. Faith.—A crowd estimated at 35,000 watched touring aircraft circuses, and local flying interest was provided by aerobatic displays by Hunter and Meteor aircraft, and by the slower but no less spectacular evolutions of Chipmunks and Balliols. Helicopters of No. 275 A.S.R. Squadron gave rescue demonstrations and startled the crowd with their manœuvrability. The flying programme ended with a spectacular display by the U.S.A.F. Skyblazers aerobatic team of five F100s.

Leeming.—Although there were storms all around, Leeming weather was kind and some 15,000 people watched a 4-hr. flying display. Formation flying, by Javelin 5s of No. 228 O.C.U. and Javelin 7s of No. 33 Squadron, was very well received, and a single Javelin 5 completed a fast run wrapped in his own cloud. The formation display ended with an upward "bomb burst." A polished display by a Skylark 3 sailplane followed and an air race was extremely popular.

Leuchars.—Although a Fighter Command station, Leuchars also has several lodger units. In the "At Home" display, Javelins of Nos. 29 and 151 Squadrons with Hunters of Nos. 43, 66 and 92 Squadrons emphasized the station's primary rôle of air defence. From the lodger units, Ansons of No. 18 Group Communications Flight recalled a wartime rôle with their demonstration of ground attack. St. Andrews U.A.S. Chipmunks showed their manœuvrability and the third attachment, C Flight of No. 275 Search and Rescue Squadron flying Bristol Sycamores, demonstrated their part in the Rescue Chain.

Marham.—The highlights of the afternoon were a fly-past by two Valiants hooked up in the "in-flight" refuelling position, aerobatics by a Hunter 6 and a fly-past by a Spitfire. There was a handicap air race between an Anson, Provost, Vampire, Meteor and a Hunter. A spectacular parachute drop from 3,000 ft. with a 15-sec. delay was made by Sgt. N. Hoffman, R.A.F., and a fire-fighting team made a rescue from a blazing Anson aircraft. The static display included a Valiant, Vulcan, Canberra, Javelin, and an F-84F. Other attractions included a display of technical equipment, aero-engines, safety equipment, ejection seats and photographs.

Norton.—An attendance of 24,000 was recorded at R.A.F. Norton, Sheffield. Norton is a non-flying station, and emphasis was laid on static displays, such as a Canberra cockpit, guided missiles and aircraft armament. The station police dogs demonstrated continuation training, the school of aerial erectors put up two 78-ft. masts, and a team of fire-fighters from Sutton-on-Hull extinguished a burning paint store.

St. Athan.—In addition to a flying display, in which many of the latest types of aircraft took part, the large crowd of more than 38,000 visitors were able to see and inspect on the ground aircraft ranging from a Sopwith Camel of World War I to a Comet 2 of Transport Command. Other attractions included a giant fun-fair with 36 stalls occupying two hangars, demonstrations and models.

St. Eval.—Approximately 8,000 members of the public attended St. Eval's "At Home," which was held in showery weather. The centre of attraction in the ground display was an undercarriage demonstration on a Shackleton; this was held in a hangar amidst a wide display of technical equipment. Aerobatic demonstrations were given by a variety of modern aircraft and a mock-up fort was attacked by a Shackleton and a Vampire, the resulting fire being extinguished by the station fire section.

Syerston.—The display was opened by a demonstration of flying aerobatics by four of the Provosts of No. 2 F.T.S. led by Flt. Lt. Trowen. A scintillating display well within the confines of the airfield was given by this team, and was enhanced by the use of double smoke streamers, one from each wing-tip. Another aerobatic display of local interest was given by a Tiger Moth of the Syerston Flying Club, which is one of the few Service-run flying clubs in the R.A.F. Nottingham U.A.S. put on a display of aerobatics with one of their Chipmunks. Two Provosts of the Syerston formation aerobatic team gave a display of synchronized aerobatics.

Ternhill.—Fine weather attracted a crowd of about 22,500, 7,000 more than last year. A thrilling and varied flying programme, with more than 25 types of aircraft, ranging from the Auster to the Victor, provided the main attraction. Mass formation flying and synchronized and solo aerobatics were demonstrated by instructors of No. 6 F.T.S., Ternhill, in Provosts, while the crowd gasped at the "bomb-burst" by Jet Provosts and the low-altitude aerobatics by Flt. Lt. Sharman in an EoN Olympia sailplane of the Wessex Gliding Club.

Thorney Island.—In fine weather about 15,000 people visited Thorney Island and saw a closely knit flying display spread over 3¼ hr. Jeffrey Quill set the pace with the opening fly-past in a Spitfire. Undoubted highlights were the formation aerobatics by the instructors of R.A.F. Oakington, led by Flt. Lt. Langley, a delayed parachute descent by Peter Lang, Sgt. Gough's aerobatics in the Skylark 3 of the Wessex Club and aerobatics by Flt. Lts. Dick and Noonan in a Meteor 7 and Provost T.1.

Turnhouse.—As anticipated, the station had a record attendance of 50,000 and the show was opened by A.C. Dickie, the most junior airman, by pressing a button to scramble four Javelins. The flying programme included aerobatics "on request" by a Chipmunk of Edinburgh U.A.S., a fly-past by 12 Javelins, a R.N. Scimitar display and outstanding aerobatics by a Vampire of R.A.F. Cranwell.

Upwood.—In excellent weather some 22,000 people visited the Station, 4,000 more than last year. A comprehensive static display in one of the hangars included a Firestreak, which received great attention. Other sections open to the public were the station workshops, parachute section, and airmens' living quarters. "Emmett Trains," which toured the perimeter tracks were most popular. The flying programme included demonstrations by a Valiant and a Vulcan and aerobatics by Hunters of No. 56 Squadron. Most noteworthy was the performance of the locally based No. 50 Squadron, led by Wg. Cdr. E. P. Landon.

Waddington.—A crowd estimated at between 40,000 and 50,000 saw a comprehensive flying display at Waddington, featuring both single aircraft and formation aerobatics by modern piston and jet aircraft. The highlight of the display, flown in ideal weather, was the individual and collective displays of the three V-bombers, which contrasted with a demonstration by a U.S.A.F. B.47. A close rival was the excellent formation demonstration given by four Fleet Air Arm Sea Hawks from Lossiemouth. There were 31 items by more than 60 aircraft in the lively and thrilling programme, worthy of the only Vulcan station open to the public.

Weeton.—Equipment on show matched the variety of trades under training at the station. Workshops and hangars were full of aircraft, engines and motor vehicles, some complete, some dismantled, and some sectioned to show the bits and pieces to advantage. Blacksmiths, welders, sheet-metal workers and turners were well represented by their equipment and examples of work.

Part of the R.A.F. Exhibition on Horse Guards Parade. Altogether about 1¼ million people visited this and other Service displays last Saturday.

Photograph copyright "The Aeroplane"

Private Flying

H.J.C.'s CLUB COMMENTARY

● THE SECOND flying week-end organized this year by the **British Women Pilots' Association** is to be held at **Ramsgate Airport,** Kent, on October 11-12.

Emphasis will be placed on parachuting, and Miss Sue Burges, well-known member of the **British Parachute Club,** will give a talk on the subject, provide some ground instruction, and make a demonstration drop.

On the Saturday evening members will be entertained to cocktails by the Mayor of Ramsgate.

The new honorary secretary of the Association, Mrs. Mavis Harriott, would be glad if those interested in attending would contact her at 41 Euston Road, West Croydon, Surrey. The former honorary secretary, Miss Janet Ferguson, will continue to serve on the committee.

● WHILE not quite reaching the target of 1,000 hr. for August, the **Fair Oaks Aero Club's** C.F.I., Wg. Cdr. C. Arthur, writes that a total of 980 hr. was recorded, despite the atrocious weather.

Members recently qualifying for their P.P.L.s include Messrs. Merriam, Macfie, Hamilton, Dance and Bailey, and A.T.C. cadets Priest, Voice, Ford, R. C. Smith, Tootal, Mulley, Pusey, Morris and Barnard. Solos have been flown by Messrs. Coupland, Hill, Chandler, Goldie-Morrison and Humphrey and Dr. Castella; also cadets R. A. Smith, Hughes, Casey and A. J. W. Smith.

The navigation competition between this club and the **Vickers Flying Club** scheduled for September 14 was abandoned through lack of entries. The "At Home" competitions are to be flown tomorrow, September 27.

The Fair Oaks newsletter records an unusual incident:—

"Another stupid accident has to be reported. A pilot flying an Auster raised the tail too high on take-off, clipped the tips off the airscrew blades, noticed nothing unusual, flew the aircraft for over an hour and was surprised to learn that he had perpetrated a super-boob, which might have had serious consequences to all concerned. A question as to the engine behaviour in the air brought the astonishing answer that apart from having an increase in r.p.m. to maintain airspeed, which was attributed to engine condition, nothing out of the ordinary was noticed. No strange noise. No vibration. The lesson is obvious."

● AMONG club and private-flying pupils there is a feeling that the P.P.L. in itself is really very little to aim at, and as an added inducement to achieve greater things the **Association of British Aero Clubs and Centres** operates (through its member clubs) advanced courses leading to Stage I and Stage II diplomas.

The first stage calls for some consolidation training, 2 hr. of instrument flying, 1½ hr. of aerobatics and 3½ hr. of night-flying, totalling 10 hr. 45 min. The second stage covers similar training but progresses on to a further total of 16 hr. 45 min. by including night cross-country flights.

These courses form an integral part of the training for the C.P.L. They are not new, but have recently been revised by the Association's pilotage committee, and should prove of interest to the club pilot who wants to extend his knowledge and experience.

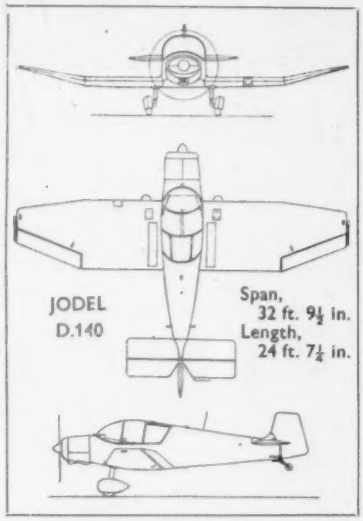
● ON October 28 the **Elstree Flying Club** is to start a comprehensive course in navigation, meteorology, aviation law, flight-planning and other allied subjects to C.P.L. standard. Lectures will be held each Tuesday for 32 weeks beginning at 10.00 hrs. and ending at 16.30 hrs., and will be given by the C.G.I. of the club, Capt. E. Brook-Williams. The cost of the course is £75, payable, if convenient, by instalments.

The club was closed from September 15 to 26, during which time some of the club aircraft were overhauled.

● AT CROYDON the **Experimental Flying Group** has suffered from a shortage of aircraft and instructors, but Messrs. A. Smith and K. Sirett, of the **Airways Aero Club** helped out on a number of occasions until the C.F.I. returned. All of the flying has been done with the Hawk-Trainer 3, G-AKAS. Another Hawk-Trainer, G-AITN, is being rebuilt by Air Couriers, Ltd.

This year to date the club has recorded 441 hr., rather down on last year's eight-months' figure of 631 hr.

● JUST appointed as sole U.K. and Commonwealth agents for the Jodel D.117 and D.140 are Rollason Aircraft and Engines, Ltd., of Croydon. These aircraft are built by the Société Aéronautique Normandes. The former is the well-known two-seater,



powered by a 90-h.p. Continental engine. Mr. Norman Jones, of Rollasons, expects to collect the demonstration aircraft, G-APOZ, from Bernay shortly, and it will be submitted to the A.R.B. for validation of the French C. of A.

The second aircraft, known as the Mousquetaire, is a four-seater with a 180-h.p. Lycoming O-360-A1A engine. Estimated performance figures are a maximum speed of 155 m.p.h., a cruising speed of 140 m.p.h. and a landing speed of 37 m.p.h. Range, about 800 miles.

Gliding Notes

by Dr. A. E. Slater

BISHOP, at the foot of the Sierra Nevada range in California, may seem an unlikely place for a national contest to those who only know of it as a site where glider pilots wait around in the hope that one day a lee wave will appear and lift them to 40,000 ft. But in fact the thermals can be pretty good there in the summer, and rise into cumulus clouds whose bases are normally between 15,000 and 18,000 ft.

This year's National Soaring Competitions were held from July 29 to August 7, overlapping our own National Gliding Week. There were 32 sailplanes entered, with 44 pilots to fly them. The struggle for top place was carried on primarily by four pilots. Graham Thomson entered with the RJ-5 in which Dick Johnson set up the present World's distance record of 535 miles seven years ago. Dick Shreder, the eventual winner, entered an HP-8. Harald ("Cowboy") Jensen, with a German Lo-150, is an emigrant from Denmark, which he has represented in World Championships; he went to Bishop by air, soaring his machine 194 miles from El Mirage.

"Hutch" Hutchinson flew a Prue 215, which has a small enough span to be included in the 15-m. class. There was a separate contest for this class, which he won, but the 15-m. competitors were also marked for the general contest. Another competitor was W. B. ("Bill") Ivans, who once set up the World's single-seater height record at Bishop, but although he was the day's winner on two occasions, he shared the use of a Ka-6B with two other people. This is the German type which won the OSTIV Standard Class prize in Poland this year; and there were three of them in the American contest. Apart from the four German machines all the rest were home-grown except for two Fauvel tailless machines, though they may also have been home-built.

* * *

In spite of Bishop's reputation for summer thermals, they had to be looked for in the right places, because the valley bottom had become unusually green owing to melted snow coming down from the Sierras. Thermal lift was only to be found over the bare mountain sides or over certain "alluvial fans" spreading out from the bottoms of various gullies. And to get the best of the mountain thermals, one had to fly in very turbulent air, unpleasantly close to the rocks.

The contest opened with an out-and-return task, 56 miles down the valley to Lone Pine and back, with several competitors returning for a second launch because they could not at first bring themselves to fly close enough to the bare flanks of the White Mountains. Soon there was so much cumulus development that the valley to the south was in shadow. Despite this, four finished the course, Graham Thomson making the fastest speed of 33.7 m.p.h. average.

Next came a so-called triangular race up the valley, and then home. Eighteen did it once and Dick Shreder did it twice, making the day's best speed on his second attempt, 116 miles at 53.4 m.p.h.

The final contest, an open day, was won by Bill Ivans with 360 miles. But the finishing order started with Shreder (5,905 points), Hutchinson (5,797), Jensen (5,417) and Thomson (5,229). The auxiliary-engined Hummingbird was well placed; presumably it reached an "alluvial fan" under its own steam before shutting off the motor.

(Some more comments on these contests will appear next week.)

A Good Day at Dunstable

A DAY of sailplane aerobatics began at Dunstable as a low overcast broke up and was replaced by fine weather, three hours after the Dunstable forecasting station stated that it had already arrived. This was on September 21, just a year after the first inter-club aerobatic contest ever held.

For this second contest, officially called the "First National Glider Aerobatic Contest," 17 entries were received from seven different clubs: two each from Bristol, Coventry and the R.A.F. Wessex Club, six from the Surrey and Army Clubs at Lasham, four from the London Club, who were the hosts, and one from the Handley Page Club.

First off was John Messervy from Lasham, in a Skylark 2 which was flown in turn by all the Lasham pilots but one; we heard that those flying it were the winners of an "eliminating" contest held at Lasham the previous week-end. But Messervy, like the third entrant P. C. H. Berthelson with the Coventry Prefect, spent too much time on the sunward side of the judges.

Flt. Lt. B. B. Sharman, from the Wessex Club, showed that the Olympia 419 can do things that some of the others cannot, by flying it upside down and then pulling it up (or should one say pushing it down?) into a stall.

Flt. Lt. A. T. Morgan, in the Bristol Skylark 2, specialized in changing direction off the top of a loop, and Flt. Lt. J. R. Ayers, of the Army Club, in tight spins, which most pilots find it impossible to persuade a sailplane to perform. However, a Kite 2 spins nicely and Arthur Doughty, of the London Club (and of the Metropolitan Police), took advantage of this.

Dan Smith, of the London Club, who won last year in an Olympia, flew Slingsby's new 12-metre Swallow this time; after doing the obligatory *chandelle* and loop, he turned it on to its back. Derek Stowe flew the Bristol Skylark 2 at high speed throughout, or appeared to do so, and Dr. D. B. James, from Lasham, was notable for the tightness of his loops.

Then came David Ince, from the Surrey Club, with the Olympia 415, whose structure will stand up to even more exotic aerobatics than that of the Olympia 419. He put the machine onto its back by performing the first half of a loop; his evolutions were all notable for the highly polished techniques with which they were done.

After D. J. Cunningham had taken the Coventry Prefect almost vertically above the judges for some of his evolutions, they lowered their heads to partake of lunch, and so did everyone else. This left six competitors for the afternoon session, and a more comfortable session it was for the judges, as by this time it was generally realized that they preferred to watch aerobatics in front rather than behind. Flt. Lt. D. Bridson, of London Club, gave a neat performance, followed by Lionel Pike, of the Army Club. Each flew a Skylark 2.

Then the Olympia 419 went up again, this time in the hands of Sgt. Andy Gough, but a good variety of aerobatics did not include flying upside-down. John Rymill followed in the Handley Page Club's ancient Rhonbussard, and gave an entertaining show with some original features.

Frank Foster did not feel in his best form, after a night spent in flying commercially, but he put his Skylark down on the spot. Finally, rumours about a new aerobatic called a "cascade" were put to the test when Lieut. Cdr. Humphry Dimmock went up in the Lasham Skylark. The cascade was an almost vertical pull-up followed by falling over sideways.

Sir Frederick Handley Page, before distributing the prizes, mentioned his first contact with aviation and went on to make some penetrating remarks about present-day aeroplanes.

The Lockheed International Aerobatic Trophy panel of judges, under the chairmanship of Major Oliver Stewart, awarded the Jack Hanks Memorial Trophy to David Ince, of the Surrey Club. The second prize, a beer tankard, went to Flt. Lt. J. R. Ayers, of the Army Club. And Dan Smith, of the London Club, won the third prize, a subscription to THE AEROPLANE.—A.E.S.

AEROBATIC WINNERS.—First prize went to David Ince, below, left, seen here with his wife; the second prize-winner was Flt. Lt. J. R. Ayers (centre), here receiving his prize from Sir Frederick Handley Page, while Godfrey Lee, chairman of the London Gliding Club, enjoys the proceedings; and the third prize went to Dan Smith (right) here being fitted into the cockpit of his Swallow.

Photographs copyright "The Aeroplane"

Correspondence

Memorial Responsibility

IN view of the general tendency in all correspondence relating to the R.34 Memorial to blame the Air League for the existence of that assymetrical double-headed kangaroo-pouched abortion which we, the public, are told is to be erected at London Airport, I would like to disclose something of the background of this distressing business and so exonerate the Air League from some of the blame for the *final* choice of design for the memorial. I might here stress that I have no connection whatsoever with the Air League, and have had no communication from, or any conversation with, any member of the Air League, nor with any other persons who have been at any time directly concerned with the R.34 Memorial project.

The Air League, with the inspiration of Frank Hillier, whose serious illness and subsequent enforced resignation from the post of secretary-general are so deeply regretted by so many, sponsored the idea of the memorial, commissioned a well-known sculptor to prepare a suitable design and fully approved a model which was submitted. This was then submitted to the Ministry of Transport and Civil Aviation which, in turn, passed it on to the architect of the building in, on or near which it is intended the memorial will be placed, for his approval. He disapproved of it.

The M.T.C.A. has gone on record as saying that it does not set itself up as an art critic, but is guided by the views of the British Fine Arts Commission.

The Air League's model was, in fact, due to be placed before the full committee of the British Fine Arts Commission, at which both Mr. Hillier and the sculptor were, at their request, to be present. Two days before the full committee was due to meet, however, Frank Hillier and the sculptor were told that their presence would not be needed as a sub-committee had already met and had rejected the model.

With their own model dismissed out of hand in this cavalier fashion, the Air League had little or no alternative but to start all over again and commission the artist recommended to the M.T.C.A. by the British Fine Arts Commission (and presumably acceptable to the architect!) to prepare a fresh design.

The Ministry's unethical behaviour in continuing to defer to the advice of the British Fine Arts Commission (in other words, ducking its responsibility) in the face of the opposition of the entire British aviation community is deplorable, and should be contested to the utmost.

London, S.W.1. LEONARD BRIDGMAN, A.R.Ae.S., S.Av.A.

Explaining the Loss

I HAVE read with interest the totally inadequate attempt to explain B.O.A.C.'s 1957 deficit made by your correspondent, A. Spooner, in your issue of September 12.

As one fairly closely connected with one of his so-called "pirate" carriers, I feel that the following points may be closer to the truth.

B.O.A.C.'s main trouble stems from the fact that their planners lacked the foresight to see any farther ahead than existing traffic demanded. At a time when the North Atlantic route did not have its present traffic density, other carriers were magnanimously allowed to transit through places like Manchester and Prestwick to pick up the few crumbs left by Britain's national airline. As traffic increased and more tourists were able to travel this route, B.O.A.C. made little attempt to offer more space, pinning their faith on London as a European gateway. Scotland is as good a place to start a European holiday as London, particularly as our other nationalized airline now offers such excellent connecting flights. B.E.A. would lose a considerable amount of traffic between Glasgow, the Midlands and London if Sabena, S.A.S. and K.L.M. were denied the use of Manchester and Prestwick Airports.

Compare also the misguided planners who as a legacy have left the Corporation with a fleet of six different types of aircraft, with their attendant servicing problems. K.L.M. and Sabena have two types to deal with on their inter-continental routes while S.A.S. has only Douglas-built aircraft in operation. Even at this time, when the Comet 4 is about to enter service, the planners have already turned their attention to the Vickers V.C.10, due in 1962. Should this aircraft meet with the success it deserves, then the Comet 4 will be relegated to medium-stage lengths or, possibly, to de luxe routes because of restricted passenger space.

Lastly, over-staffing has been said to contribute to the high running costs of B.O.A.C. This is true, but the hierarchy at the top of B.O.A.C. appear to want to dismiss the wrong people. The long-needed pruning should take place somewhere between the chairman and the hard-worked airport staffs. Only then perhaps would we see an efficiently run airline and there would be no need to cast envious glances at other carriers not burdened by so much deadwood.

Glasgow, W.4. A. B. EDGAR.

Aeronautical Antiques Offered

I HAVE in my possession a Blériot airscrew which is in very good condition. I also have a well-made Blériot pressure pump. This I believe was used for increasing the pressure in the petrol tank. I wonder if you, or any of your readers, could help me to find a suitable home for these items.

83-87 High Street, Tunbridge Wells, Kent. R. E. NIGHTINGALE.

Groundabout

Le Farnborough and La France

Among the Society's guests, there were listed a Herr Prang from Germany and a Mr. Bump from U.S.A. But search the 1,300 French names as I might, there was not one Monsieur Circuit.

*

At the Press Tent bar: French aviation writer, after tasting his beer: "*C'est magnifique mais ce n'est pas lager.*"

*

The S.B.A.C. should know that they get full value from the French TV people. In a Noyon hotel lounge on September 4 evening, I saw a splendid 30-minute film of the Display, including five minutes of the Rotodyne and almost the full treatment of the C.F.S. Jet Provost show. Next afternoon in a small town *tabac*, there it was again. Their newspapers, too, know a good thing when they see it. One provincial paper printed a picture of Treble-One's smoking bomb-burst climax with the caption "*Eventail Illusion*," which I took to mean "The Eventual (or Final) Trick," until my dictionary revealed that *eventail* meant "fan." Finally, in my holiday hotel bedroom, the *froid* tap, which provided *chaud* water, made a noise most agreeably like a Viscount taxi-ing in. Always and everywhere there is the aviation.

*

Words, Words. I sometimes work my brain to the bone trying to turn neat titles here so I envy the Americans their gift for this sort of thing. In the latest *Boeing Magazine*, over an article on their new B-52G bomber for Strategic Air Command: MORE SOCK FOR SAC.

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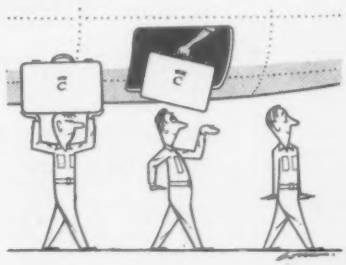
IATA says the airlines should improve their baggage handling—"Techniques used for loading baggage on to a DC-7C are similar to those used for loading Cleopatra's trunks on to a Nile barge."



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One for the Kiddies' Party. Have you heard of the interesting though expensive game played by some of these rough, rollicking aeronauts? The players sit round a table, each with a bottle of whisky and a glass. They talk and drink until the whisky's all gone, then one leaves the party. The others have to guess who it is.

by Gren

NOTES AND EVENTS

ROTODYNE SERVICING.—The Morfax mobile workshop in action during the servicing of the Fairey Rotodyne at the recent Farnborough Show. The workshop is equipped with its own generating plant, lathe, pillar drill, grinder, compressor, portable tools, floodlights and a B.O.C. Argon-arc welding plant.

R.A.F. CONTRACT.—Zwicky, Ltd., of Slough, has been awarded a contract for the supply of aerodrome runway sweeper/collectors for the R.A.F. Known as the Mk. F.E.1-10, the sweeper/collectors have a working speed of 4 to 12½ m.p.h. and a sweeping width of 10 ft. There is a 3½-cu.-yd.-capacity refuse container.

DUNLOP HOSE.—The Dunlop Rubber Co., Ltd., has introduced a new hose for use in the aircraft industry. Made of p.t.f.e., it can withstand temperatures between −70° C. and +250° C., and is available in bore sizes of $\frac{1}{16}$ in. to 1 in. up to a maximum length of 15 ft.

AUSTRALIAN REPRESENTATIVES.—It is reported that Canadair, Ltd., is planning to establish an Australian representative in Melbourne in the near future. It has not been decided yet whether to set up an office or appoint a local company as agents.

STRAIGHT LIFT.—The new Jones KL10-10 mobile crane, with specially designed sheer legs in position, lifting a Gloster Javelin of No. 46 Squadron. Manufactured and exported by K. and L. Steelfounders and Engineers, Ltd., of Letchworth, Jones cranes are distributed in the U.K. by George Cohen Sons and Co., Ltd., of Wood Lane, London, W.12.

Aviation Calendar

September 27-28.—"Tipsy Week-end" organized by the A.S. Flying Club, at Baginton Airport, **Coventry.**

September 30.—R.Ae.S. London Airport Branch lecture, "The 707," by M. Pennell (chief engineer, Boeing Airplane Co.), in the Senior Mess Club, 4th Floor, B.O.A.C. H.Q., **London Airport,** at 18.00 hrs.

October 1.—Kronfeld Club, American film evening, at 74 Eccleston Square, **London,** S.W.1.

October 3.—Helic. Assn. of G.B. lecture, "All-weather Helicopter Systems," by W. Gerstenberger (chief of dynamics, Sikorsky Aircraft), in the R.Ae.S. Library, 4 Hamilton Place, **London,** W.1, at 18.00 hrs.

October 4.—Aviation Forum of London lecture, "The Channel Air Bridge," by Douglas Whybrow, at the Imperial Hotel, Elizabeth Street, Victoria, **London,** S.W.1, at 19.00 hrs.

October 8.—R.Ae.S. Weybridge Branch lecture, "The Physiological Aspects of High Performance Flight," by Dr. K. G. Williams, M.A., L.R.C.P., M.R.C.S. (deputy head of research, Vickers Group Research Establishment), at the Apprentice Training School, Vickers-Armstrongs (Aircraft), Ltd., **Weybridge,** at 18.10 hrs.

October 8.—R.Ae.S. Gloucester and Cheltenham Branch lecture, "The History of the Supermarine Works," by A. N. Clifton, M.B.E., B.Sc., F.R.Ae.S., at the Wheatstone Hall, Brunswick Road, **Gloucester,** at 19.30 hrs.

October 8.—R.Ae.S. Manchester Branch lecture, "Some Problems of Supersonic Flight," by L. P. Twiss, O.B.E., D.S.C., A.F.R.Ae.S. (Fairey Aviation Co.), in the Reynolds Hall, College of Technology, **Manchester,** at 19.30 hrs.

October 8.—Kronfeld Club talk, "OSTIV and What It Does for Gliding," by Alan Yates, at 74 Eccleston Square, **London,** S.W.1.

October 9.—Society of Instrument Technology, Control Section lecture, "Aircraft Flight Simulators," by Dr. A. E. Cutler, B.Sc., Ph.D., at Manson House, Portland Place, **London,** W.1, at 17.30 hrs.

October 9.—R.Ae.S. 14th British Commonwealth Lecture, "Some Aspects of Canadian All-weather Fighter Development," by J. C. Floyd, F.R.Ae.S., at the Royal Institution, 21 Albemarle Street, **London,** W.1, at 18.00 hrs.

October 10-11.—College of Aeronautics, **Cranfield,** open days, from 11.00 to 18.00 hrs.

HELICOPTER MOVE.—Helicopter Sales, Ltd., of Watford, is moving its offices to 2 Lowndes Street, London, S.W.1 (Tel. Belgravia 6477-79), as from September 30. Wg. Cdr. A. R. Collins has recently joined the company. He previously acted as an aeronautical sales consultant.

NAPIER STORY.—The history of D. Napier and Son, whose founding as a company goes back to 1808, has been set out in a book, "Men and Machines," to commemorate the company's 150th anniversary. The authors are Charles Wilson and William Reader and the book is published by Weidenfeld and Nicolson. It costs 35s.

MET. REPORT.—Newly published by H.M.S.O. is the Meteorological Office report for the year ended March 31, 1958, price 3s. 6d.

Company Notices

NEW COMPANY

Scottish Agricultural Aerial Services, Ltd. (33,308).—Private co. Reg. in Edinburgh on Aug. 28. Cap. £100 in £1 shs. Objects: To carry on the business of sprayers of farm lands, pastures, hill, marsh and moorlands, etc. Directors: C. J. Campbell, Balblair, Invershin, Sutherland; C. L. Chafer, Kirkgate Lodge, Sawdon, Scarborough, Yorks; J. V. W. Fleming, Clay of Allan, Fearn, Ross-shire; A. Pilsworth, Farndale, Burnhead. Sec.: E. Wright. Reg. Off.: Strathmore Tannery, Coupar, Angus.

OVERSEAS COMPANY

Air Express International Corporation (F.4,725).—Particulars filed Sept. 4, 1958, pursuant to Section 407 of the Companies Act, 1948. Cap.: Stock, $1,000,000. Reg. in the State of New York in December, 1935, to act as brokers and agents for airplane, steamship and railroad carriers and transportation companies and carriers, etc. British address: Building 114, London Airport, Hounslow, Middx, where Alexander I. Shand is authorized to accept service of process and notices. Directors: Chester M. Mayer, Charles L. Gallo, Morton L. Deitch, Allen Russell, Wickliffe Shrive, Jack F. Chrysler and John B. Walker, all resident in the U.S.A.

INCREASE OF CAPITAL

Avica Equipment, Ltd. (327,419). 50 Pall Mall, London, S.W.1.—Increased by £10,000 in £1 ordinary shs., beyond reg. cap. of £30,000.

New Patents

APPLICATIONS ACCEPTED

803,906.—Chance Vought Aircraft, Inc.—"Means for controlling release of blast gases for armament on airoraft."—Jan. 18, 1957. (Jan. 20, 1956.)

804,043.—Auster Aircraft, Ltd., and Payne, P. R.—"Rotary wing aircraft."—Jan. 18, 1955. (Jan. 18, 1954.)

Applications open to public inspection on Nov. 5, 1958; opposition period expires on Feb. 5, 1959.

Personal Notices

BIRTHS

Carter.—On Sept. 9, at R.A.F. Hospital, Cosford, to Jo (*née* Harfood), wife of Flg. Off. D. Carter—a daughter.

Gilby.—On Sept. 11, at Taunton, to Kay (*née* Martin), wife of Sqn. Ldr. D. A. Gilby—a son.

Mann.—On Sept. 14, at R.A.F. Hospital, Ely, to Winifred (*née* O'Donnell), wife of Wg. Cdr. A. S. Mann, D.F.C.—a son.

Mills.—On Sept. 12, at R.A.F. Hospital, Changi, Singapore, to Pamela (*née* Jones), wife of Flt. Lt. N. H. Mills, R.A.F. Medical Branch—a daughter.

MARRIAGE

Sample—Black.—At Stockton on Tees, Mr. Arthur Wheaton Sample to Miss Margaret Ann Black, members of Yorkshire Gliding Club.